URBAN DEVELOPMENT STANDARDS

A DEMONSTRATION OF THE POTENTIAL FOR REDUCING COSTS

A study prepared for the programs section,
Local Planning Policy Branch,
Ontario Ministry of Housing

Ontario

MINISTRY OF HOUSING
The Hon. John R. Rhodes, *Minister*
D.A. Crosbie, *Deputy Minister*

LOCAL PLANNING POLICY BRANCH
G. Keith Bain, *Director*

PROGRAMS SECTION
Mark Heitshu, *Manager*
Frank Martin, *Senior Planner*

CONSULTANTS:
Peter Barnard Associates
John G. Williams Associates
Cummings-Cockburn & Associates

Available from:
Ontario Government Bookstore
880 Bay Street, Toronto
Price: $2.00 payable to Treasurer of Ontario

URBAN DEVELOPMENT STANDARDS

A DEMONSTRATION OF THE POTENTIAL FOR REDUCING COSTS

A study prepared for the programs section,
Local Planning Policy Branch,
Ontario Ministry of Housing

Ontario

Preface

The preparation of this report was directed by the Local Planning Policy Branch. Much of the work was carried out by a team of consultants composed of Peter Barnard and Associates, John G. Williams Associates and Cumming-Cockburn and Associates. In effect, the study built upon an earlier report by the Ontario Housing Advisory Committee which dealt with engineering servicing standards, but it was expanded to take into account all aspects of subdivision design.

Background work for the study was carried out by the Local Planning Policy Branch during part of 1975. This involved extensive interviews with municipal planning directors and engineers across the province in order to explain the purposes of the study, discuss current development standards, as well as to explore the possibilities of new or innovative designs with these municipal personnel. Moreover, during the preparation of the terms of reference and during the period of the writing of the report itself, a great deal of advice and guidance was given by an interministerial technical advisory committee.

The central objective of the study was to examine ways and means by which the development costs of new housing in subdivisions could be lowered. The technique employed essentially involved reviewing existing

development standards in use across the province and then analysing the possibilities of reducing these standards where it was felt they were excessive or in other cases by suggesting alternative approaches that could be adopted. The major criteria examined included lot sizes, set-backs, road rights-of-way and pavement widths, as well as the engineering services contained within the rights-of-way. To clearly illustrate the magnitude of the savings that are possible and their exact nature, it was decided that it would be useful to develop specific subdivision designs which would allow a direct comparison between what was considered to be conventional designs and standards, and the suggested alternative ones.

It is hoped that the study will now be examined closely by the municipalities of the province and by other agencies and groups, both public and private, concerned with the provision of housing within a sound community planning framework. When comments from all sectors have been received and considered, the objective will be to formulate policy guidelines for a new set of development standards which, while preserving a pleasant living environment, can result in a significant reduction in housing cost to the new home buyer.

G. Keith Bain,
Director,
Local Planning Policy Branch.

March, 1976

Table of Contents

	PAGE
SUMMARY	*i.*
CHAPTERS:	
1. Deciding on the Study Approach	1
2. The Standards Used	11
3. The Comparisons	40
4. Conclusions and Implications	55
APPENDICES:	
A. Engineering Standards	A.1
B. Site Planning Standards	B.1
C. Lot Design Studies	C.1
D. Unit Costs	D.1
E. Land Use Analysis	E.1
F. Cost Comparisons	F.1
G. About Our Firms	G.1

Summary

In recent years there has been a growing concern that the standards required for the planning and servicing of subdivisions are excessively high. Many have felt that if development standards could be made more realistic the rate of increase of housing costs could be moderated.

But what are the potential savings from reduced standards? While a recent study by the Ontario Housing Advisory Committee* began the process of rationalizing certain engineering standards, many aspects of the problem were not covered, most notably the question of site planning standards. Accordingly this study was commissioned to demonstrate the cost savings which can be realized through development standards which can be rationally defended, yet which are generally lower than those in conventional use across the Province.

Our conclusions ....

1. Significant cost savings are possible using standards already accepted in various parts of the Province. Our studies show that savings in the order of $6,000 to $8,000 per lot are possible. These estimates are based on cost analysis using actual plans of conventionally designed subdivisions and comparable designs using

---

* *"Recommended Guidelines for Residential Servicing in Ontario" Ontario Housing Advisory Committee (OHAC), December, 1973.*

reduced standards which are merely a compendium of the most progressive current practice in the Province and, indeed, many of which are minimums recommended by the largest mortgagor of subdivision housing (CMHC). Savings of this magnitude could reduce an owner's monthly mortgage payment by $70. or more. Translated to a broader scale it can be conservatively estimated that $100 million could be saved annually in the Province.

2. While there are significant savings in reduced engineering standards, more rational site planning standards are the key. Of the total savings identified approximately 75% can be attributed to permitting reduced lot sizes - down to 30ft. x 80ft. for a single detached dwelling in the major metropolitan areas, and to 30ft. x 100ft. elsewhere, together with comparable reductions in lots for other house types. Our studies show that such lots can meet CMHC standards for outdoor space and separation between dwellings and also provide a good quality living environment. In fact, compared to conventional practices, our proposed standards and cost comparisons include increased landscaping and privacy screening, more parkspace landscaped for children's play and improved control over design and siting of individual units. The remaining 25% of cost savings can be largely achieved through changes in three key engineering standards - the type of storm drainage system, right-of-way and road widths, and finally the method of connecting sanitary sewage and water service to individual lots.

How the study was carried out .....

Our basic approach has been to prepare several subdivision designs for a site typical of those found around urban centres in Ontario. Two designs were prepared representative of current conventional practice, the first employing a housing mix and development standards similar to those found in the largest urban centres, and the other more representative of the rest of the Province.

Next, two designs were prepared with the same two housing mixes but using engineering and spatial standards which were lower yet not so drastically lower as to be unacceptable to the persons setting standards or to result in an unacceptable urban environment. The total of four designs were then costed - both in total and for the main components of cost - and the totals compared. The results, together with the rationale for the standards used, form the basis of this report.

Implications of the work .....

It should be emphasized that this study is merely a demonstration of the savings potential through reduced development standards. The actual savings will vary depending on local land and construction costs. But the results raise some possible issues:

- <u>Will implementation of the proposed standards be impeded by municipalities' concerns for a strong tax base?</u> Despite the considerable cost savings to be gained through adopting the proposed guidelines, there

may still be concerns that smaller lots bring in less revenue but require the same level of municipal services as larger lots. If such proves to be the case then it may be necessary to examine the significance of this issue.

- How can cost savings through reduced standards be passed on to the homebuyer? Market realities may mean that lower costs resulting from reduced standards may not be reflected in lower house selling prices. Nevertheless by permitting reduced, yet realistic standards, the municipality provides the developer with greater flexibility to match the product to the consumer's needs and ability to pay. Thus such development could make home ownership available to persons previously unable to afford it. However, it still may be necessary to examine methods by which savings resulting from reduced standards may be passed on to the homebuyer more directly.

As this study demonstrates, by reconsidering the standards in their municipalities, local officials can do much toward reaching the common goal of reducing housing costs. Furthermore, this can be achieved in a manner which enhances the urban environment.

1. Deciding on the Study Approach

Determining how to carry out this study has not been easy. On the one hand our objective has been to demonstrate the cost savings which can be realized through lower urban development standards. But what types of standards should be considered in the study? How low is low? Recognizing the great variation in standards which currently exists, which parts of the Province should the study be directed at? How should the standards used be justified? And above all, how can we do the study in such a way as to convince those involved to modify their standards and lower housing costs?

In many respects we have felt that the approach used in the study was almost as important as the results. Accordingly, in this Chapter we should like to briefly outline the scope and the rationale for the approach we have used to demonstrate the cost savings that could be achieved through reduced urban development standards.

TWO SEPARATE COMPARISONS ARE REQUIRED

Our first problem was to develop an approach to the design and cost comparisons which would produce results which were credible to a wide range of municipal viewpoints. Throughout Ontario, there is a great variation in planning standards, mainly reflecting the different market conditions in the large and smaller municipalities. Because of high land costs, sub-divisions built in the larger metropolitan areas generally have a mix of single and semi-detached units as well as a proportion of link and/or street townhousing. In contrast other areas of the Province with lower land costs still build mainly single detached housing with some semis. Land costs are also a significant factor prompting larger cities to permit smaller lot sizes than other parts of the Province.

Considering that the situations - and thus the viewpoints with which municipal officials will be examining the results of the study - are quite different between the major metro areas and the remainder of the Province, we decided to prepare two separate cost comparisons for a typical site each employing a different housing mix:

1. Ontario Standards - Conventional and Proposed
   In the first comparison, we employed a set of conventional standards representative, in our judgement, of those now being used outside of the major metro areas. The design prepared using these standards was then compared with another prepared employing the proposed set of lower standards. Again, in our judgement, these can be justified based on current knowledge and experience in the Province. Both the conventional and pro-

posed site designs employed the same housing mix (Exhibit 1.1). This mix was recommended for use in this study by the Ministry of Housing based on an analysis of approvals over the past year outside of the major metro areas.

2. Metropolitan Standards - Conventional and Proposed
The second comparison was geared to the situation around the largest two or three cities in the Province. This comparison employed the same conventional and proposed minimum engineering standards as the first comparison but used smaller lot sizes within both site designs and a housing mix reflecting the different market conditions (Exhibit 1.1). Again the housing mix was selected in consultation with the Ministry of Housing.

SPECIFIC STANDARDS CHOSEN AFTER DETAILED REVIEW

While details of the standards used in the comparisons will be discussed in Chapter 2, it is important to outline our general approach to selecting the standards.

Earlier on in this study we decided that the scope of our work must be kept as broad as possible, so that no one could disagree with our results because they did not take into account certain standards having a critical bearing on the cost of serviced land in the Province. In scope, the standards - and ultimately the cost comparisons - cover the

HOUSING MIX ASSUMPTIONS

Exhibit 1.1

	Single	Semi	Link*	Street Townhouse
ONTARIO STANDARDS				
Conventional / Proposed	80%	20%	-	-
METROPOLITAN STANDARDS				
Conventional / Proposed	50%	20%	10%	20%

* *Link houses differ from street townhouses in that a link unit provides access to the rear yard through the garage without going through the living area of the dwelling unit.*

full range of site planning and engineering considerations:

- Site planning includes standards related to public open space and school site areas as well as those related to individual lot dimensions. (Exhibit 1.2) In addition where higher density designs were prepared standards for comprehensively planned developments (C.P.D.) were employed.

- Engineering standards included a full set related to the layout and design of roads, storm and sanitary sewers, water supply and utilities. (Exhibit 1.2)

It is well known that engineering standards vary widely across the Province. While some of the differences can be attributed to climatic conditions and economic circumstances in the municipalities, it is equally clear that much of the variation reflects different attitudes as to what standards are appropriate. The OHAC study* demonstrated the large variation which exists even in the engineering standards pertaining to engineering design within the road right-of-way. Our review of existing engineering standards indicated that the variation seemed greater between different geographic areas of the Province than between municipalities of different size.

At this point it should be noted that the study did not cover non residential development standards or trunk servicing standards beyond a subdivision's boundaries. Also specific details of utilities' standards were not considered beyond that necessary to ensure that the needs of utility

---

* *"Recommended Guidelines for Residential Servicing in Ontario" Ontario Housing Advisory Committee (OHAC), December 1973. See Chapter 3 for summary of current servicing standards.*

SCOPE OF STANDARDS INCLUDED*

Exhibit 1.2

SITE PLANNING STANDARDS

Maximum: lot coverage, length of local streets, intersection spacing

Minimum: yard dimensions (front, rear, and side), lot sizes, floor areas by house type and number of storeys, landscaped outdoor living area, parking spaces, pedestrian and emergency vehicle access, public open space, school site areas

ENGINEERING STANDARDS

Roads: classification into local and collector, categories by number of housing units and traffic volume

right-of-way, boulevard, pavement widths

numbers and widths of sidewalks by road classification

design of pavements, sidewalks, and curbs

Storm Drainage: design assumptions on storm intensity, entry time and run-off coefficients

service connections for individual lots and function of the system

maximum pipe diameter and frost cover manhole and catch basin spacing and design

Water Supply: minimum pipe diameter, frost cover

valve line intervals and intersection valving

hydrant location and spacing

service connection location and diameter

Sanitary Sewers: minimum pipe diameter, frost cover curviture

manhole spacing

number of lots per service connection

Utilities: location of hydro, telephone, gas and cable TV in relation to road cross section

---

* *Chapter 2 contains more specific details of the actual standards used in the cost comparisons*

companies could be accommodated in the designs prepared. Also excluded from the study was consideration of other development cost items apart from standards such as municipal charges, fees, interest on financing, developer overhead and profit etc. This omission is not to say that these cost items are not important contributors to serviced land costs, but rather that our work has been confined to examining the impact of physical design standards. Allowance for these other items was made, however, in the final cost comparison (See Chapter 3).

Although the time available for the study did not enable us to carry out any original research, we have attempted to justify all the standards used on the basis of:

- available studies and handbooks - particularly the OHAC report for engineering standards and the latest revisions to the CMHC Site Planning Handbook for planning standards, particularly relating to lot sizes and setbacks

- experience in the Province, particularly where reduced standards have been employed successfully such as in the Central Park development in Bramalea and in Kitchener's Special Development program. In this connection we have talked with municipal officials and made changes where experience warrants

- and finally, our judgement as to what are typical standards and what minimums could be introduced

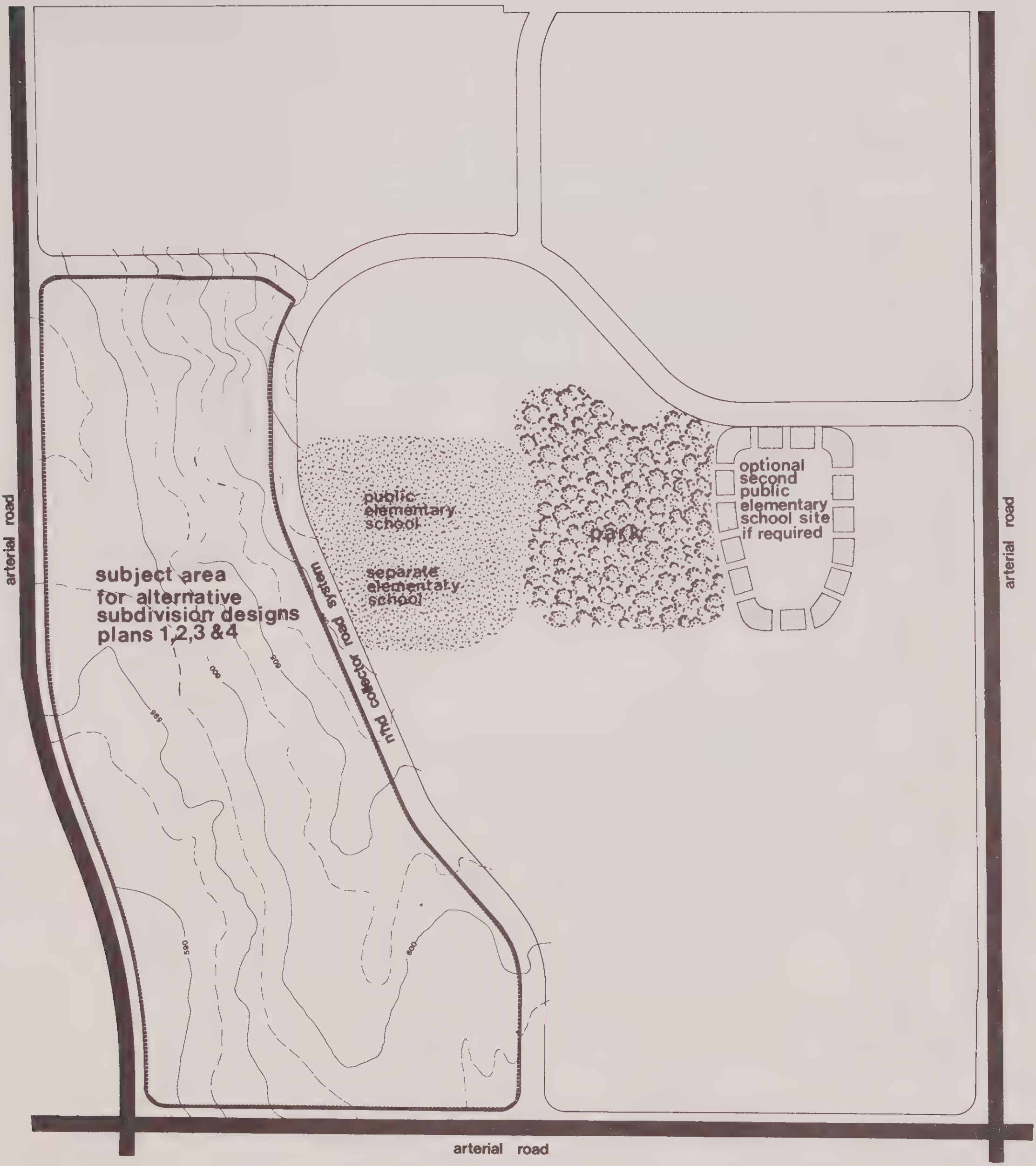
Secondly, where a choice was to be made we always opted for the standards which would not exaggerate the cost savings. That is, the standards used represent neither the highest (or most conservative) set of conventional standards, nor the lowest possible set of reduced standards. And finally, we have focused on those few key standards which account for the bulk of cost savings potential and spent considerably less effort in justifying the myriad of other less critical standards.

TYPICAL SITE CHOSEN AND COST COMPARISON DEVELOPED

After considering several alternatives, an actual 200 acre site was chosen for the design studies and the cost comparisons. Its specific location is not important since the standards applying in the municipality were not used as the basis for either of the conventional designs. However the site is currently under development and incorporates housing, four school sites and park space in its overall plan.

An outline of the actual secondary plan for the site is shown in Exhibit 1.3 together with the acreages devoted to each type of land use. The site was chosen as being typical in a number of respects:

- 200 acres is typical of a school-sized neighbourhood
- the site is undulating, has normal clay soil and a low water table
- the site is an old farm with typical hedge rows and is bounded by arterial roads on three sides
- it has a well defined neighbourhood collector road system with access to major roads



neighbourhood planning context

0' 500'

exhibit 1·3

Thus the site is, in our view, quite typical of those being developed in the Province, particularly around the larger centres where the bulk of new housing is now being built.

A 50 acre corner section of the site was selected for the detailed design and cost studies (see Exhibit 1.3). This section, which was also residential in the actual subdivision plan for the site, is large enough to be a planned section and has general dimensions which are sufficient to allow planning flexibility in the design. The section is also typical in that it incorporates part of the interior collector road system and has two sides backing onto arterial roads.

In the next chapter we will discuss the details of the key engineering and planning standards used in sample designs and then in Chapter 3 the final cost savings will be derived from estimates of the development costs for the site as a whole, based on the sample designs and cost analyses for the 50 acre residential segment.

2. The Standards Used

Preliminary cost analyses early in the study emphasized that a very few standards account for the bulk of the savings opportunity. The purpose of this chapter is to describe the standards used and our rationale for their choice with particular emphasis on the critical standards. A complete listing of both the engineering and planning standards employed in the study is included in Appendices A and B.

A. ENGINEERING

As mentioned in Chapter 1, engineering standards vary considerably across the Province, and not necessarily according to size of municipality. After reviewing the situation, we concluded that a single set of engineering standards would be employed for both "Ontario" and "Metropolitan" conventional designs and a different set for the proposed guideline or reduced standards.

For the conventional standards we made considerable use of the results of the OHAC survey of municipal standards. However, these standards covered a more restricted scope than we needed and many of the survey results were, in our opinion, clearly not typical of current practice. Accordingly, we used the OHAC results where they were considered appropriate and adopted others according to our judgement and experience on what was most representative of current practices.

Similarly, modifications were needed to the OHAC recommended standards, first to include standards not covered in their report and second to develop standards for those that OHAC stated in indefinite terms. Also, we found that many of the OHAC recommendations were excessively conservative in the light of current practices in many parts of the Province. Therefore, for standards not stated by OHAC and for those with which we disagreed, we have proposed new standards based on judgement or in some cases on what some more cost conscious areas of the Province are now doing. Thus the engineering standards which we have used are far from "innovative". They really represent a consolidation of related standards already in use to varying degrees, in various parts of the Province.

In developing the standards our early cost studies showed that three key standard areas account for 80% of the potential savings: the type of system and design parameters for storm drainage, the road cross-section, and the method of providing water and sanitary service to individual lots.

STORM
DRAINAGE

The two types of standard critical to the potential savings in storm drainage are illustrated in Exhibit 2.1:

- System function: The conventional designs employ a storm drainage system with a service connection to each lot (and therefore a pipe along the length of every street). The service connection provided drainage for run off from roofs and for weeping tiles around basement footings. Street and rear lot catchbasins

STORM DRAINAGE STANDARDS

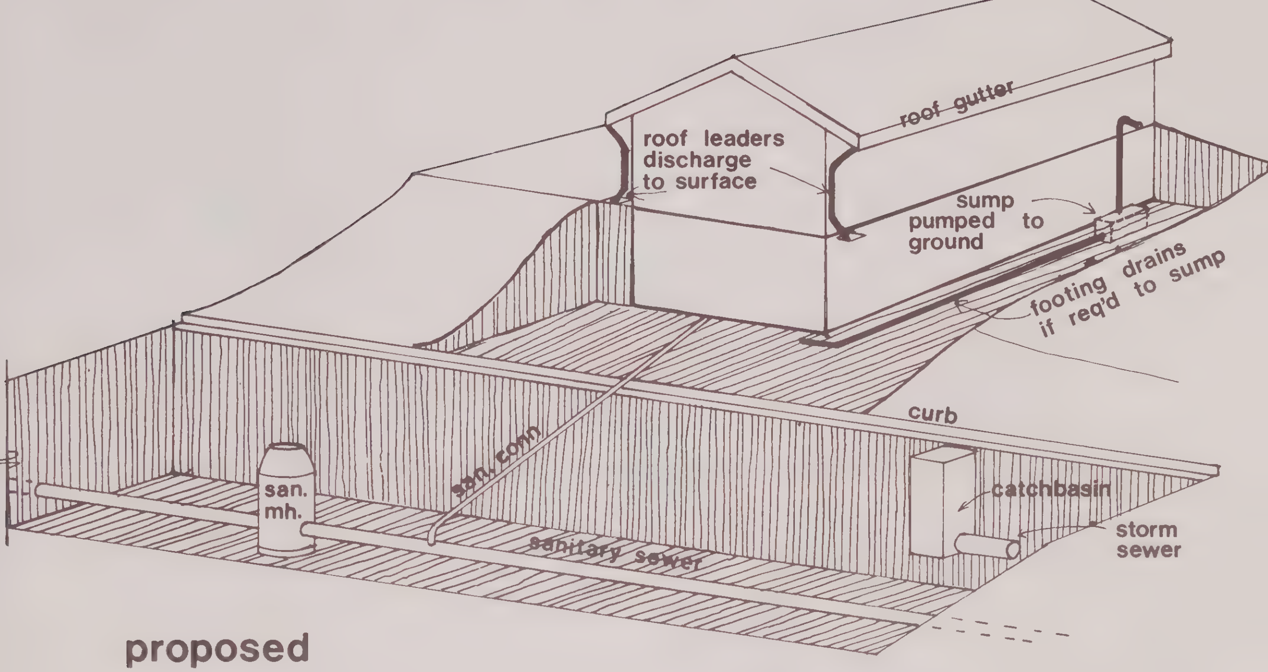
Exhibit 2.1

	CONVENTIONAL	PROPOSED
<u>TYPE OF SYSTEM</u>	Catchbasins for road drainage Source connections to all lots for footing and roof drainage	Catchbasins for road drainage, roads designed as drain sections for surface overflow No service connections. Roof drainage to ground, footing drainage to sump if high water table
DESIGN CRITERIA		
Storm Intensity		
-sewer	5 year	2 year
-surface overflow	Not required	25 year
-initial entry time	10 min.	No maximum, calculated to reflect actual design situation based on over-land and gutter flow times
Run off coefficients		
-detached	0.40	0.60
-semi	0.40	0.60
-link and street townhouse	0.60	0.65

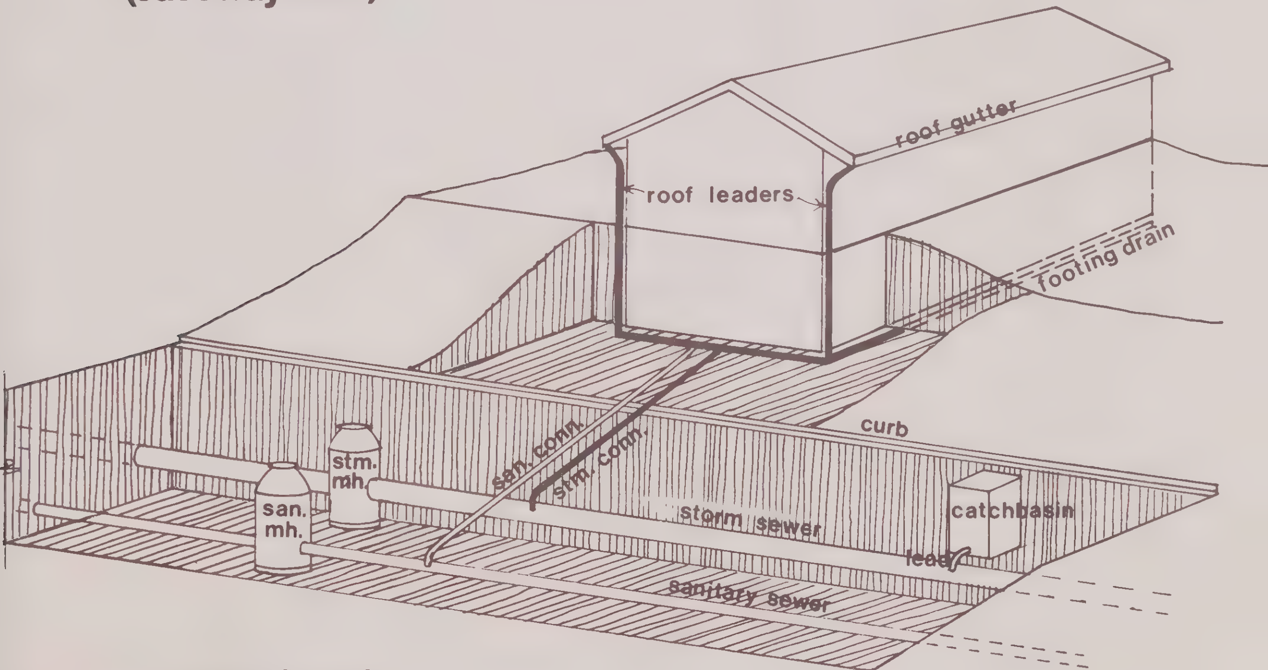
pick up the surface run off and feed into the storm sewers at intervals. This is the common storm system throughout most of Eastern Ontario, including Toronto. (See bottom illustration Exhibit 2.2)

In the proposed guideline standards, all storm service connections to individual lots are eliminated (Exhibit 2.2, top). Roof drains discharge to the ground and footing drains are intended to be installed only when there is a high water table, in which case drainage would be to a sump in the basement, with a pump provided to discharge to the ground surface, when required. Road drainage is again provided through catchbasins as in the conventional designs but with spacings adjusted to reflect gutter and inlet capacities. Since there are no service connections, storm sewers become required only as needed to drain street and rear lot catchbasins. Thus the total sewer length is reduced by eliminating initial legs. Our rationale for using this approach is that it has been successfully employed in areas of Western Ontario for a number of years, as for example Brantford and Kitchener-Waterloo, and other areas such as London and Cambridge employ variations of the approach which also eliminate service connections.

- Design criteria: These refer to the design assumptions employed in the storm drainage calculations, including storm intensity and surface run off coefficients for various housing types. Our conventional standards adopted the "median or most used" standard from the OHAC summary of existing residential servicing standards for Ontario (see OHAC p.14), excepting for the entry



proposed
(cut-away view)



conventional
(cut-away view)

storm drainage systems

exhibit 2·2

time factor, where a judgement substitution was made. The OHAC summary gave no indication of present practice on surface overflow conditions, but from the criteria which were given and our own experience, this practice is presently the exception rather than the convention. The OHAC summary of run off coefficients also gave no indication of their relationship to lot sizes and coverage, but based on experience, they have been taken to be compatable with the conventional lot sizes used in this study.

The proposed guideline designs were based on a two year storm intensity (as recommended by OHAC) together with roadway surface overflow provisions which, in effect, introduce a level of protection to flooding presently lacking in conventional systems. The run off coefficients used in the proposed designs actually result in a 50% higher run off. This more than compensates for the reduced storm intensities and results in increased costs relative to the conventional designs. The coefficients were calculated using OHAC's recommendations assuming a clay soil condition with 2-7% slope, together with an adjustment to account for the increased proportion of the lot area occupied by houses in our proposed designs. Also, under the proposed standards, initial entry times reflect the actual length of run, surface, section and grade rather than the less realistic conventional practice of fixing an arbitrary time period regardless of circumstances. Finally, while adding to costs, it is implicit in these standards that careful attention is given to grading of the lots to provide efficient run off away from the foundations. For both conventional and proposed designs we have taken drainage

to be normally directed to the front of the lot with the exception of link and street townhousing where drainage to the rear with swale and catchbasin outlets is assumed.

Other storm drainage standards such as pipe diameter, use of curvilinear pipe, manhole and individual catchbasin spacing and design, etc. have a relatively minor effect on cost. Details of these other standards used in the comparison are contained in Appendix A, together with explanatory notes on the reasons for their adoption.

It should be noted that the proposed standards continue to accept the rational design method, and the basic objective of conventional storm drainage design practice which is to eliminate ponding and to rapidly remove storm water from ground surfaces. This approach is, however, being increasingly questioned, particularly its effect on downstream conditions. There is considerable opinion that an approach emphasizing retardation and retention would provide a more optimum result. To some extent, the proposed standards move in this direction by returning roof flows to the ground surface and by increasing the length of overland flow. Studies on this question are now in progress within the provincial government and other agencies. These could lead to further cost reductions from those shown here. It is to be hoped that these studies, which are primarily concerned with storm water quality and downstream effects, will consider the implications for subdivision design as well. As a final comment further design efficiencies and cost savings would result if the rational design method were replaced with more refined methods now in existence.

SANITARY AND WATER SERVICE CONNECTIONS

Apart from the elimination of storm water service connections to individual lots, further savings can be realized through use of double rather than single service connections for water supply and sanitary sewers. Exhibit 2.3 shows the standards used in our cost comparisons.

While the OHAC study did not deal with the frequency and grouping of service connections, the use of single water connections in separate trench is common practice in many parts of the Province. The use of double connections is uncommon, but installation in common trench with the sanitary and/or storm connection is, for example, permitted in Gloucester Township, Brantford, Cambridge, Durham and Halton. We have combined the two practices, partly to achieve cost savings and partly to minimize interference with the road base.

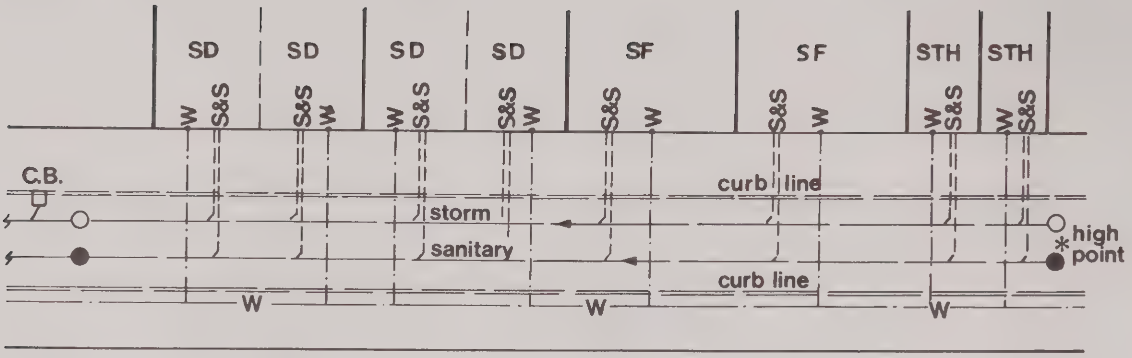
The same applies to sanitary service connections. They are commonly provided to each lot and laid in a common trench with the storm service connection. In our proposed approach, storm service connections are eliminated (see previous discussion) and therefore the sanitary service is laid in a common trench with the water service, one for each two units.

Exhibit 2.4 illustrates the concepts. Details of the service connection standards are also included in Appendix A.

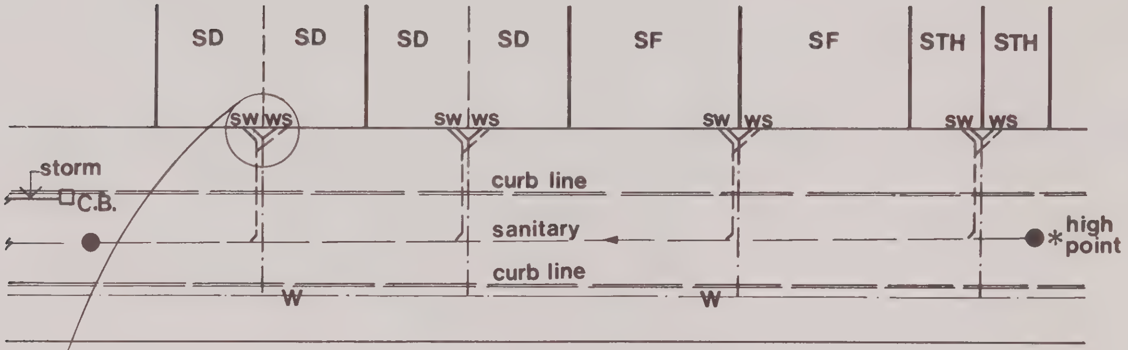
SANITARY & WATER SERVICE CONNECTIONS

Exhibit 2.3

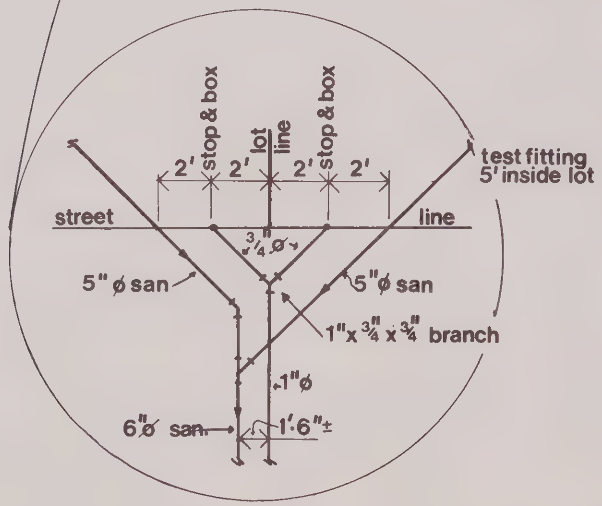
	CONVENTIONAL	PROPOSED
SANITARY	Connection to each lot	Single connection to every two lots
	Laid in common trench with storm service connection	Laid in common trench with water service connection
WATER	Connection to each lot	Single connection to property line of every two lots
	Laid in separate trench	Laid in common trench with sanitary service connection



conventional pattern



proposed pattern



service connections
exhibit 2·4

ROAD CROSS-SECTION

The important standards relating to road cross-section are shown in Exhibit 2.5 and the remainder outlined in Appendix A. The key to the standards is the road classification system and definitions which we have adopted. While drawing on the OHAC report we believe our approach leads to a more rational and responsible set in relation to current practice in the Province.

The OHAC report recommended two local street classifications, with upper limit of 100 tributory units, and one collector road classification with two road width variations for loadings beyond 100 units. After much consideration we have concluded that the OHAC recommendations do not deal sufficiently with the requirements of neighbourhood collector roads, that the limit of 100 units between local and collector definitions is inappropriate, and that in general the OHAC approach would result in designs that are excessively conservative, when compared with current practice in many parts of the Province. We have concluded that a limit of 150 units for local roads together with greater consideration of the actual function of both local and collector roads leads to a more realistic approach.

Therefore we suggest the use of the five classifications shown in Exhibit 2.5. Within these the conventional standards generally correspond to the "median or most used standard" reported in the OHAC survey for the two classifications of road given - local and collector. Their collector classification was used in our designs for those roads with obvious collector function, and their local classification for all others. However the proposed standards allow for a more

ROAD CROSS-SECTION STANDARDS

Exhibit 2.5

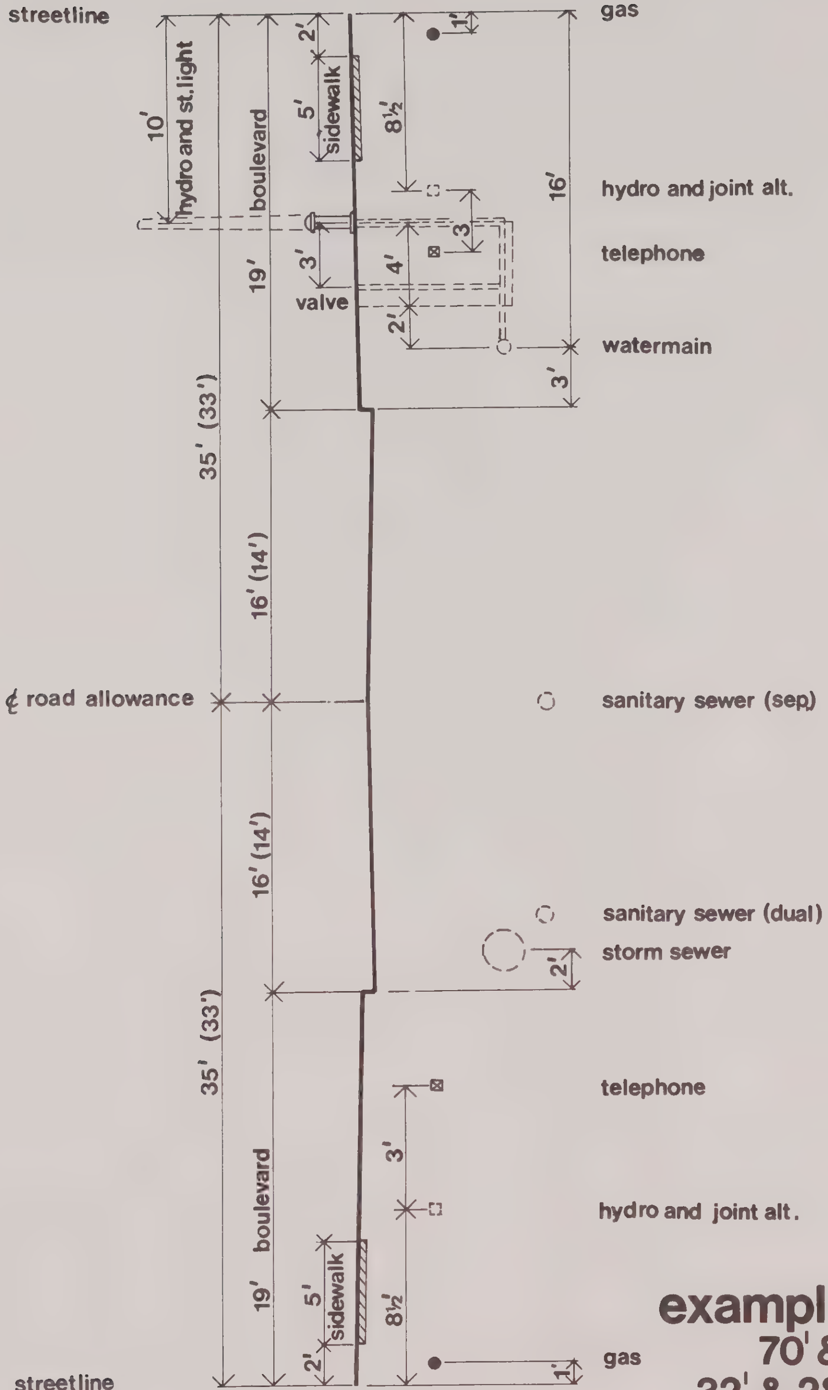
	CRESCENT P-LOOP CUL-DE-SAC	LOCAL	MINOR COLLECTOR	NEIGHBOUR-HOOD COLLECTOR	COLLECTOR
NO. OF UNITS	0-100	0-150	150-350	350-450	450+
R.O.W.					
-conventional	66'	66'	66'	76'	---
-proposed	50'	56'	66'	70'	80'
PAVEMENT WIDTH					
-conventional	28'	28'	28'	36'	---
-proposed	26'*	28'	28'	32'	42'
BOULEVARD WIDTHS					
-conventional	19 + 19	19 + 19	19 + 19	19 + 19	---
-proposed	9 + 15	12 + 16	19 + 19	19 + 19	19 + 19
SIDEWALKS					
Sides					
-conventional	2	2	2	2	2
-proposed	1*	1	2	2	2
Width					
-conventional	5'	5'	5'	5'	5'
-proposed	4'	4'	5'	5'	5'

* *For Cul-de-sacs less than 350' long to bulb and with less than 40 units, use 24' pavement width, and with no sidewalks unless through pedestrian passage is required.*

gradual increasing of dimensions to reflect the loading from the number of units tributary to the road in question, and recognize more accurately the actual function the street is to serve:

- Collector roads: Three different collector classifications are identified: a minor collector which employs the same standards as those used for local roads in the conventional standards; a neighbourhood collector which would be used under normal neighbourhood design conditions; and a wider collector for use in neighbourhoods that are particularly dense or have few outlets to arterial roads. The latter two employ the OHAC - recommended boulevard and pavement widths for collectors. The minor collector has the same boulevard width but a pavement reduced to that of the top classification of local street, 28 ft. Boulevard widths are therefore the same width as assumed in the conventional standards to maintain the same convenience for utility installation. Finally, sidewalks are proposed on both sides for all collectors since they are expected to normally provide for major pedestrian movement. The proposed road cross-sections for collectors are illustrated in Exhibit 2.6.

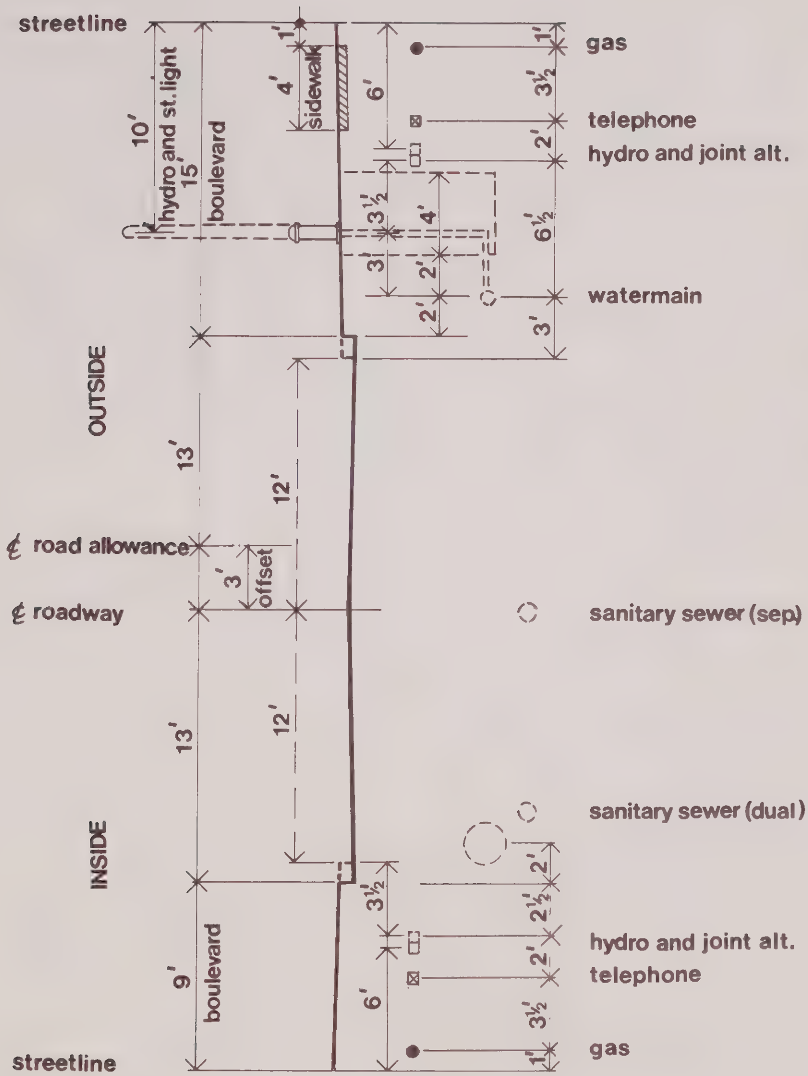
- Minor local roads: At the opposite end of the scale from the collectors, this classification covers small crescents, P-loops and cul-de-sacs with under 100 units. This unit loading corresponds to that for local roads recommended by OHAC. The road section (Exhibit 2.7) is based on a 50 ft. right-of-way with the same pavement widths and sidewalks as recommended by OHAC for local roads. Utility clearances are essentially the same and correspond to accepted practice in some parts



example section
70' & 66' r.o.w. – 32' & 28' pavements (collector & minor collector)

minor collector dimensions shown in brackets

exhibit 2 · 6



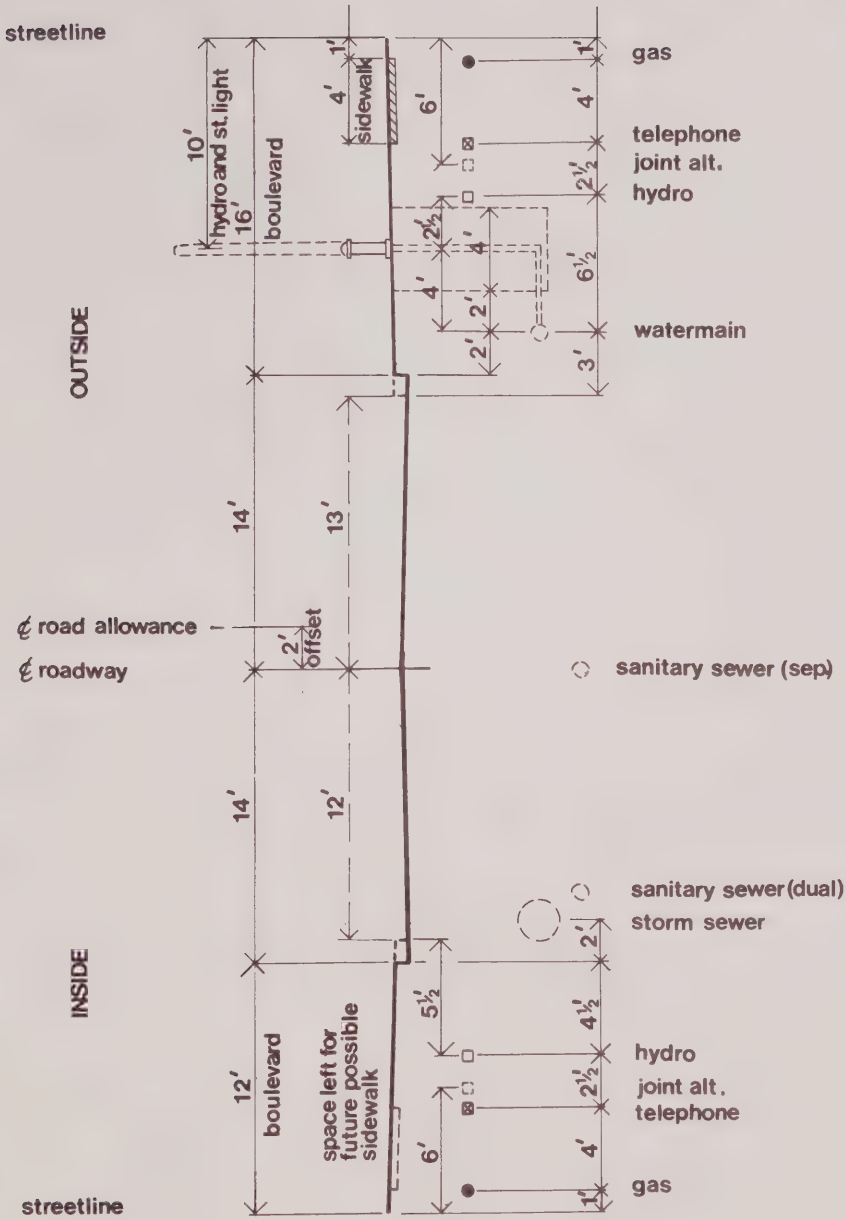
example section
50' r.o.w. – 24' or 26' pavement
(minor local)

exhibit 2 · 7

of the Province where reduced road allowances are already in use. The major variation from OHAC which has been introduced involves locating primary utility alignments in a wider boulevard on one side of the street, where the necessary vault clearances are maintained. The single sidewalk and street lights are also located on that side. The other side is left for secondary utility use, and without vault clearance requirements, may be narrower. The resulting saving in width requirement is combined with an offset pavement to permit the narrower road allowance.

For short cul-de-sacs a small reduction in pavement width is permitted to reflect street scale, and the sidewalk eliminated where there is no through requirement. We have, however, refrained from the obvious possibility of further reducing road allowance width.

- Local roads: Between the minor local roads and the smallest collector, we have introduced a further classification to cover local streets with higher unit loading or different configuration from the minor local classification. This road section (Exhibit 2.8) uses a similar offset centerline approach as used for minor local roads, but with a wider 56 ft. road allowance to allow for pavement widening to a conventional 28 ft. standard as used for the minor collector section. This also permits additional utility clearance space to reflect the heavier installations and increased maintenance frequency which may result from a larger number of dependent units. No configuration restriction is proposed for this classification to allow use in connector streets where appropriate.



example section
56′ r.o.w. – 26′ or 28′ pavement (local)

exhibit 2 · 8

The above road classifications can be readily justified by reference to the approaches used in Central Park (Brampton) and the Kitchener special development program, as well as practice in a number of other municipalities. While most utility organizations have resisted any change to space standards on the grounds that maintenance costs would rise, the road and utility interrelationships proposed here take the utilities' needs into account. While perhaps less than the optimum from the utilities' points of view, these changes contribute to the cost savings and incorporate road and utility maintenance relationships which are essentially those accepted now by Oakville, Brampton and Waterloo.

It should be noted that the road cross-sections are based on the snow storage requirements for areas of low snowfall such as the southern part of the Province. In the North, and other areas with significantly higher snowfall, there is a need for a 12 ft. minimum distance between sidewalk and curb, thus increasing the allowance for minor local and local roads by 2 ft. and 1 ft. respectively. The effect on costs of these changes even when added to requirements for added frost cover, is negligible.

Finally, there are a number of areas where further reductions in standards could be considered. For example, we have not reduced pavement widths to the extent incorporated in Central Park (Brampton) due to reports of resident dissatisfaction. However further examination could justify such widths. Sidewalks could be eliminated from local streets as in some current practice. Watermains could be

relocated within the road width and some road allowances could be pressed below the 50ft. limit. In the interests of the credibility of our cost comparisons, however, we have chosen not to incorporate such changes in our proposed standards.

The standards proposed have been drawn largely from our experience, with limited back-up from the OHAC report. However, if there is one area meriting further detailed examination it is the subject of road classifications and width requirements.

B. PLANNING

Because of the different housing mixes used for the "Ontario" and "Metropolitan" comparisons, and to reflect differing practices with regards to minimum lot sizes, a separate set of site planning standards was developed for each of the four designs prepared. For the conventional standards we used our judgement of current practices both in metro areas and elsewhere in the Province. For certain key standards, such as minimum lot and dwelling sizes reflecting current practice, the Ministry of Housing provided the information from their files.

For the proposed standards we adopted in large measure the recommendations of the CMHC Site Planning Handbook and recent amendments regarding small lots.* Where we have deviated from these recommendations, whether to a higher or a lower standard , we have provided a rationale for so doing.

---

* *"Site Planning Criteria for Housing on Small Lots in Comprehensively Planned Developments. An Amendment to the Site Planning Handbook", CMHC, undated.*

Use of the CMHC standards requires Comprehensive Planning Development (CPD) procedures in that design and location of the individual dwelling units is an integral part of the preparation of the overall site design. In addition, design control should extend to control over external materials and colour as well as siting and landscaping to achieve consistent quality of treatment since increases in density require increased design quality to maintain an acceptable environment.

To provide guidance as to the level of density which could be provided without CPD procedures, we also developed a fifth set of standards. Analysis and judgement of this set indicates that the maximum net density for non-CPD is about 10 units per acre. Details of these and the four sets of planning standards employed in the cost comparisons are provided in Appendix B.

The key site planning standards relate to minimum yard distances which, in combination with house area and sidewalk location, dictate the lot sizes. Other less critical, though nonetheless important standards concern park and school area requirements.

MINIMUM LOT SIZES

The minimum lot sizes used in the cost comparisons are shown in Exhibit 2.9. Conventional lot sizes for singles and semis were adopted after discussions with the Ministry of Housing and those for link and street townhousing deduced from our own experience. Lot dimensions in the proposed standards were developed from design studies employing zero lot line with CMHC recommendations for minimum yard

MINIMUM LOT DIMENSIONS AND AREAS

Exhibit 2.9

	ONTARIO		METROPOLITAN	
	CONVENTIONAL	PROPOSED	CONVENTIONAL	PROPOSED
SINGLE DETACHED	50' x 110' (5500)	30' x 100' (3000)	45' x 110' (4950)	30' x 80' (2400)
SEMI DETACHED (1 unit)	32½' x 110' (3575)	26½'x 100' (2650)	30' x 110' (3300)	30' x 80' (2400)
LINK HOUSE	32' x 110' (3520)	26' x 100' (2600)	32' x 110' (3520)	28½' x 80' (2360)
STREET TOWNHOUSE	22' x 110' (2420)	21' x 100' (2100)	22'x110' (2420)	18' x 80' (1520)

distances. Details of these studies are presented in Appendix C. It should be noted that minimum lot sizes do not represent the average in any given subdivision design. Rather, there will be a range of dwelling types and spatial solutions above the minimum.

The lot sizes are a function of other standards, specifically minimum yard distances, dwelling configuration and areas, and dwelling coverage.

- Minimum yard distances: These distances are shown in Exhibit 2.10. The conventional standards are based on our judgement of current Ontario standards and vary only in terms of the 5 ft. difference in front yard distance. The proposed standards conform to CMHC recommendations expanded to cover the setback of garages and carports from the lot line, depending on whether there is a sidewalk or not. Where no sidewalk is provided, one of the two parking spaces per unit is provided on the driveway which is set back 14' from the property line and 23 ft. from the roadway curb under minimum boulevard width conditions. Thus under this provision, parking space for a second car would be provided partially outside the lot area (see left hand illustration in Exhibit 2.11). The parking of the second car on boulevards without sidewalks is commonplace in many subdivisions and was successfully used as a design condition in the Central Park Project. Where a sidewalk is provided, the distance from carport to garage to the lot line is the conventional 20 ft. (see right hand illustration in Exhibit 2.11).

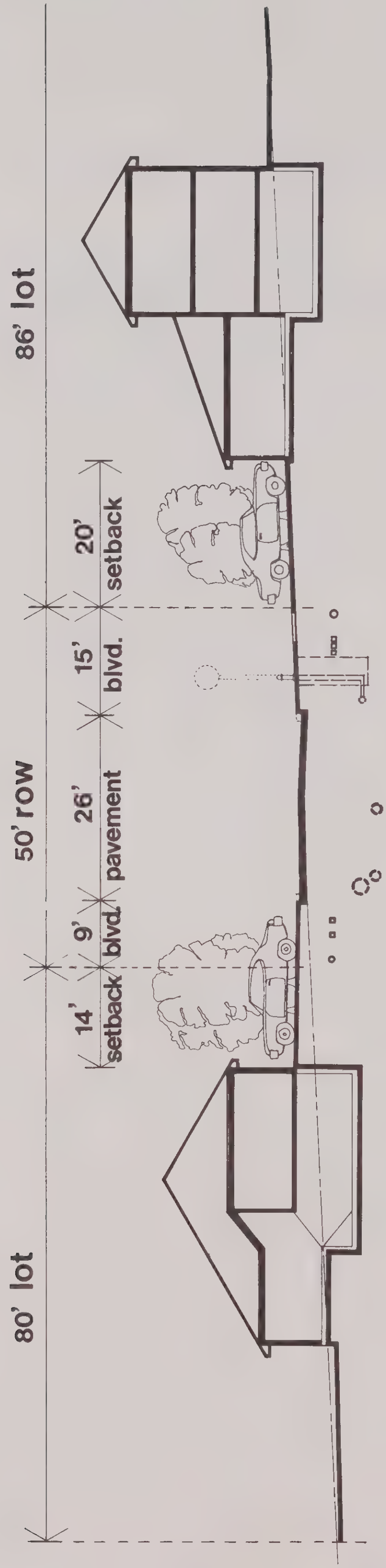
MINIMUM YARD DISTANCE (FROM LOT LINE TO HOUSE) Exhibit 2.10

	ONTARIO		METROPOLITAN	
	CONVENTIONAL	PROPOSED	CONVENTIONAL	PROPOSED
FRONT YARD				
to habitable room ***	25'	10'	20'	10'
to living room	25'	15'	20'	15'
to garage or carport				
-with sidewalk	25'	20'	20'	20'
-without sidewalk	25'	14'	20'	14'
REAR YARD				
to living room principal window	25'	25'*	25'	25'*
to habitable room other than living room principal window	25'	18'*	25'	18'*
lot backing onto arterial	65'	65'*	65'	65'*
SIDE YARD				
internal side yards both sides	4' + 2' for each storey or partial storey above the first			
zero side yard with maintenance easement	not permitted	permitted	not permitted	permitted
flankage yard on corner lot	15'	4' + 2' etc. with privacy screening between street & exposed rear yard	15'	4' with privacy screening between street & exposed rear yard**

Plus privacy screening in form of fencing and/or landscaping (and/or berming for lots backing onto arterials)

* *House to be no closer than 20' from corner lot point to maintain corner vision for traffic*

* *Other than living room*



representative section – minimum lot depths

exhibit 2·11

It should be noted that these minimums occur only in the proposed metropolitan standards (where minimum lot depths are 80 ft. or 86 ft. where lots front on a sidewalk) and on crescents, p-loops or cul-de-sacs where boulevard widths can be as low as 9 ft. On other types of road, the space provided for the second car will be greater. To further illustrate the solutions possible, Appendix C shows the siting of the different house types on 80 and 86 ft. deep lots fronting on rights-of-way.

With the exception of the standards on setbacks to garages and carports, all other standards conform to CMHC recommendations. It should be noted however that all rear yards under 35 ft. and the 65 ft. minimum rear yard backing onto any arterial road must be accompanied by fencing, landscaping and/or berming in our proposed standards - in fact a higher standard than the conventional, where no fencing is required. This new standard conforms to the most recent CMHC requirements.

- Minimum dwelling sizes and coverages: The standards used for minimum floor area of the dwelling units and their coverage of the lot (not including basements and garages or carports) are illustrated in Exhibit 2.12. Since the aim of this study was not to investigate the effects of reducing the areas of small houses, moderate sized dwellings of 1000-1200 sq. ft. living area have been used in the site testing models. In many instances, larger floor areas could be achieved. Maximum lot coverage is often a requirement in conventional standards and we have used 35% of the lot area for singles,

MINIMUM DWELLING SIZES

Exhibit 2.

	ONTARIO		METROPOLITAN	
	CONVENTIONAL	PROPOSED	CONVENTIONAL	PROPOSED
SINGLE DETACHED				
-1 storey	1000	1000	1000	1000
-1½ storeys	1200	1000	1200	1000
-2 storeys	1400	1000	1400	1000
SEMI DETACHED				
-1 storey	1000	1000	1000	1000
-1½ storeys	1000	1000	1000	1000
-2 storeys	1300	1000	1300	1000
LINK HOUSE				
-2 storeys	1300	1000	1300	1000
STREET TOWNHOUSE				
-2 storeys	1400	1000	1400	1000

Note: Lot coverage for 1 storey dwellings is equal to the dwelling area and for 2 storeys, equal to half the dwelling area. For 1½ storeys the coverage varies according to house design.

semis and link and 40% townhouses, for both conventional standards. No such criteria is used in the proposed standards where coverage is the result of conforming to minimum yard distance requirements and building areas. As well, all designs satisfy the requirement in the CMHC Handbook that a minimum landscaped outdoor living area be provided for sitting out, children's play, barbecuing, etc. at least equal to 50% of the total floor area of the dwelling unit.

SCHOOL AND PARK STANDARDS

The remaining planning standards play a less significant, though nevertheless important role in the designs. However school and park standards are worth a brief explanation, (Exhibit 2.13).

- Standards for areas of school sites were based on our experience and no special research was carried out into this subject. Conventional standards for Metro areas were used for both proposed guidelines. While a standard is given, high schools have been excluded from our cost comparison as are churches and commercial areas since they are all significant only at a larger community scale and are not considered areas of cost saving.

- Park standards use the traditional 2.5 acres/1000 population. However, as density increases it becomes undesirable to provide neighbourhood parks which are larger (say over 10 acres) than can be effectively used. Thus, for the higher density proposed standards some of the park space is shifted into local small parks (termed

SCHOOL AND PARK STANDARDS

Exhibit 2.1

	ONTARIO		METROPOLITAN	
	CONVENTIONAL	PROPOSED	CONVENTIONAL	PROPOSED
SCHOOL SITE AREAS (ACRES)				
-public high schools	18	15	15	15
-public junior high schools	10	8	8	8
-public elementary schools	6	5	5	5
-separate high schools	7	6	6	6
-separate elementary schools	4	3	3	3
PUBLIC OPEN SPACE (ACRES/1000 POPULATION)				
-neighbourhood park	2.5	1.75	2.5	1.75
-local housing area communal amenity space (C.A.S.)	-	0.75	-	0.75

communal amenity space) within each neighbourhood. In fact, as shown in the next Chapter, the 0.75 acres/1000 requirement can be readily combined with excess area from lots to provide considerably more community park space than the minimum standard.

The full sets of planning standards used are given in Appendix B including standards for other conditions such as local street lengths, geometry and intersection dimensions, as well as our suggestions for the standards to be used for subdivision designs up to 10 units per acre which do not require Comprehensively Planned Development procedures.

The proposed standards used for the "metropolitan" design could be further reduced beyond those used here. For example, we have not permitted back-to-back units, side-by-side car parking or sidewalks closer than 9 ft. to the curb, all of which could further reduce minimum lot sizes. Also, any alteration of the housing mix in favour of fewer single detached and more of the higher density forms would also alter the densities considerably.

As a final note, many of the proposed standards discussed in this chapter are in fact higher than those employed in the older (and in many cases much in demand) neighbourhoods in our largest cities - areas not normally considered to be substandard by their residents. Thus our proposals are more a return to the notion of permitting more flexibility in minimum lot sizes and servicing standards rather than significant reductions in current standards. By adopting our proposed standards a municipality is permitting its developers greater flexibility in fitting the "house plus land package" to the purchasers' needs and ability to pay.

3. The Comparisons

Four neighbourhood subdivision plans were prepared for the 50 acre corner section of the site shown in Exhibit 1.3 using the engineering and planning standards discussed in the previous chapter. These plans were then analysed and costed in detail. Finally, these costs were incorporated into cost estimates for the entire 200 acre neighbourhood in order to arrive at estimates of total cost savings resulting from the comparison. Details of the designs and cost analyses are contained in the Appendices. The purpose of this Chapter is to outline the salient features of the designs and to present the findings of the cost studies.

It must be pointed out that the layouts used here are typical of the type of subdivision now being built in Ontario; that is, every house is ground related and fronts on a street. They are not meant to represent innovative design concepts. It is recognized that many forms of non-conventional layout could have been used but, since the purpose of the study is to examine standards and cost savings, it was felt that using conventional layouts would be most illustrative.

FOUR SUBDIVISION DESIGNS PREPARED

In addition to fitting into the general shape, boundary conditions and topography of the site, the designs incorporate a similar collector road system and at least one of each type of local road (cul-de-sac, P-loop and crescent). Lot designs were varied to provide not only the desired mix of housing types, but also a range of dwelling size and configuration (bungalow, split level, and 1, 1½ and 2 storey units, each with single

attached garage). A total of 13 house types and designs up to a maximum of 1500 sq. ft. are included. (See Exhibits C.2 and C.3 in Appendix C for actual floor plans).

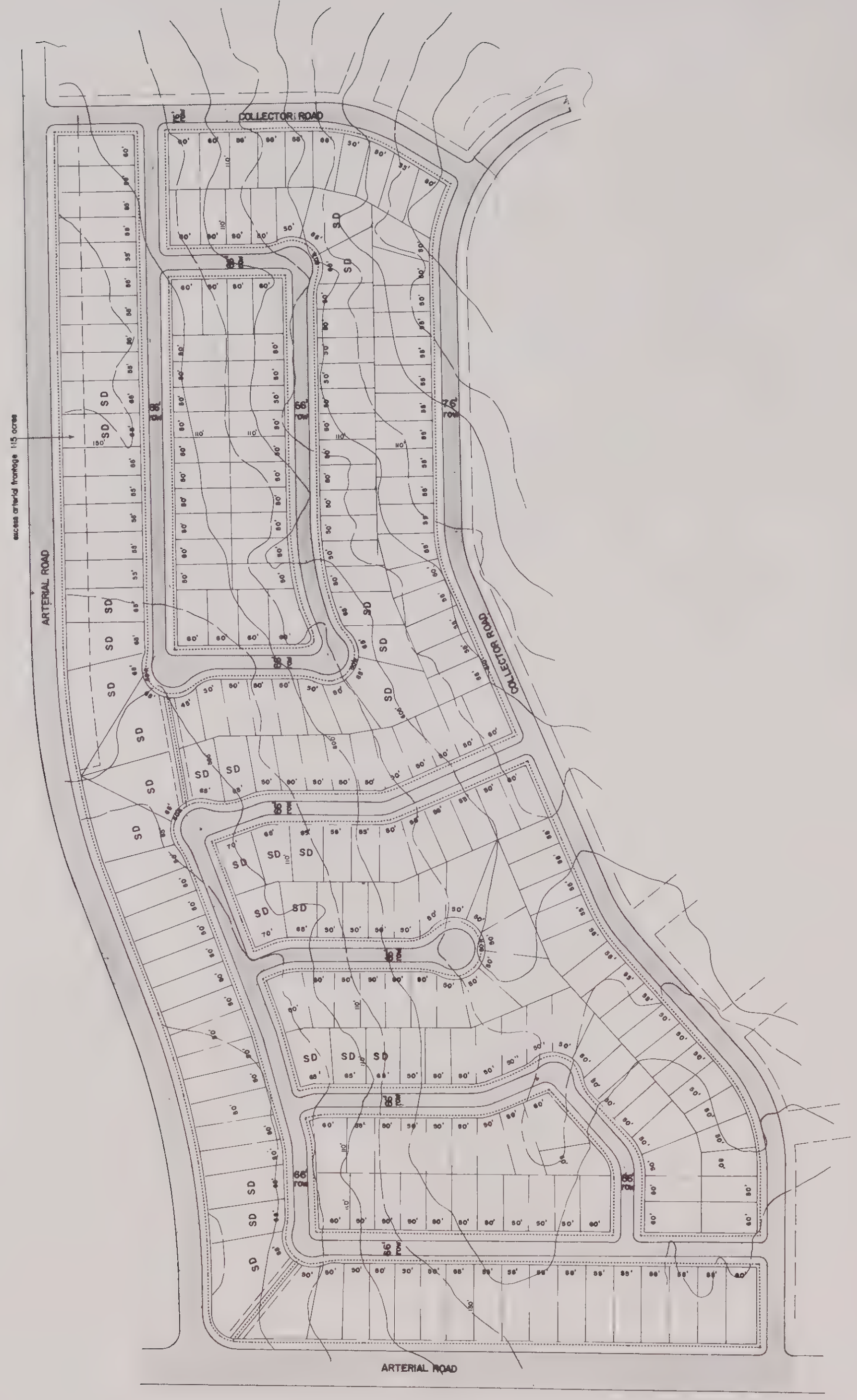
The four plans are presented in Exhibits 3.1 to 3.4 and the important statistics summarized in Exhibit 3.5:

1. Ontario Conventional. This plan has a local road pattern which incorporates a loop road, crescent, cul-de-sac and P-loop. The general road configuration is influenced by the internal lot depths of 110 ft. and the conventional allowances for road right-of-way. Pedestrian links are provided to connect adjacent areas of the neighbourhood and emergency vehicular access from the P-loop is provided.

2. Ontario Proposed. The reduction in lot depths to 100 ft. from 110 ft. and the reductions in road allowances affect the shape of the plan and change the street pattern from that of the first plan, although the full range of road types is still provided. Local parks within the subdivision area (communal amenity areas) in the order of 1/2 to 2/3 of an acre in size are provided throughout the plan in locations where they can be introduced by reducing the area of pie-shaped lots at corner conditions. In this way "short-cut" pedestrian connection is provided to adjacent streets and to the neighbourhood park and school areas. The higher density housing forms, including street town housing and link forms, are clustered around these areas.

3. Metropolitan conventional. The plan is similar to (1) in all respedts except that the housing mix is changed and therefore more lots are provided.

4. Metropolitan proposed. Again the plan contains the full range of street types and bears some resemblance to (2).



S.F.- Single Family
SD.-Semi Detached
------sidewalk

	UNITS	%	
60' S. F.	21	8.0	80%
55' S. F.	53	20.0	
50' S. F.	137	52.0	
70' S. D.	4	2.0	20%
65' S. D.	48	18.0	
	263	100.0	

plan 1 ontario conventional

0' 100' 200' 300' 400'

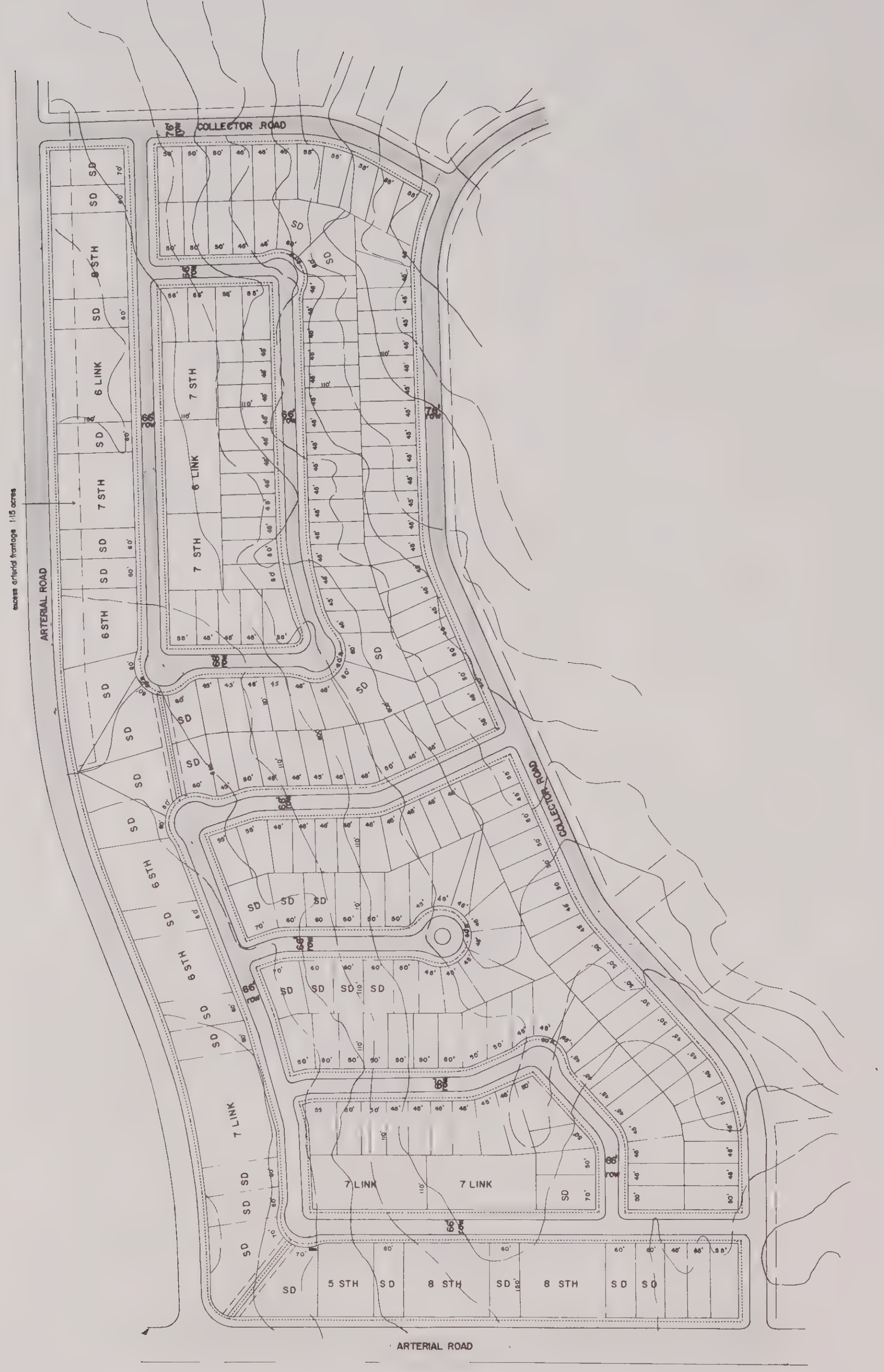
exhibit 3.1

SF - Single Family
SD - Semi Detached
------ sidewalk

	UNITS	%	
40' S.F.	100	24.0	80%
35' S.F.	132	32.0	
30' S.F.	100	24.0	
26.5' S.D.	42	10.0	20%
30' S.D.	40	10.0	
	414	100.0	

plan 2 ontario proposed

exhibit 3.2



		UNITS	%	
SF-Single	55'S.F.	17	5.0	50%
Family	50'S.F.	42	12.5	
SD-Semi	45'S.F.	110	32.5	
Detached	40'S.D.	4	1.0	20%
LINK-Link	30'S.D.	66	19.0	
Housing	30'LINK	33	10.0	
STH-Street	20'S.T.H.	68	20.0	
Townhouse		340	100.0	

-----sidewalk

plan 3 metropolitan conventional

exhibit 3.3

		UNITS	%	
SF Single	40'S.F.	51	10.0	
Family	35'S.F.	50	10.0	50%
SD Semi	30'S.F.	150	30.0	
Detached	35'S.D.	30	6.0	20%
LINK Link	30'S.D.	72	14.0	
Housing	28.5' LINK	50	10.0	
STH Street	20'S.T.H.	52	10.0	
Townhouse	18'S.T.H.	52	10.0	
sidewalk		507	100.0	

plan 4 metropolitan proposed

exhibit 3.4

Layout is affected by the internal lot depths of 80 ft. where there is no sidewalk and 86 ft. with sidewalks. Again higher density housing forms are clustered around the communal amenity spaces. Only a proportion of lot sizes are the minimum standard while others are wider to provide for a broad variety of housing types and still others are larger due to road configuration or amenity considerations. In the latter case, where a bank is required to moderate lot grades to a maximum 5% slope, the rear yard of the unit has been increased by 10 ft. to preserve the usability of the rear yard, exclusive of the bank.

In developing the areas and quantities to be taken off as part of the cost comparison, we had to ensure that the appropriate proportion of overall arterial and collector system for the entire 200 acre area was attributed to this 50 acre section. By taking half the width of the collector roads shown on the plan the proper relationship was maintained. However, since this section of the site backed on arterial roads on two sides, a larger than appropriate proportion of rear lots backing onto arterials resulted. Thus a slight adjustment was required to exclude some of the excess arterial lot depth from the area attributed to the 50 acre subdivision in order to give it the appropriate proportion of arterial lots as in the whole 200 acres.

As a final point on the plans, the design of the engineering services for each plan proceeded according to the standards outlined in Chapter 2. Due to the nature of the slope of the entire site, provision had to be made for storm runoff from other parts of the site to be taken through this section. The sewers were sized accordingly and this was included in the costs.

SUMMARY OF SUBDIVISION PLANS (50 ACRES RESIDENTIAL)

Exhibit 3.5

	ONTARIO			METROPOLITAN		
	CONVEN.	PROPOSED*	% CHANGE	CONVEN.	PROPOSED*	% CHANGE
NET (LOT) DENSITY** (u.p.a.)	6.46	12.42	92	9.31	17.04	83
GROSS DENSITY (u.p.a.)	5.36	8.37	56	6.93	10.36	50
AREA (ACRES)						
-gross area	49.10	49.44	-	49.10	48.97	-
-residential (net lot area)	36.52	33.31	-	36.52	29.76	-
-roads & emerg. access	12.58	14.09	-	12.58	16.27	-
-communal amenity space	-	2.04	-	-	2.94	-
UNITS						
-single detached	211	332	58	169	251	49
-semi detached	52	82	58	70	102	46
-link	-	-	-	33	50	52
-street townhouse	-	-	-	68	104	53
-Total	263	414	58	340	507	49
AVG. LOT AREA/UNIT (SQ. FT.)	6743	3507	48	4679	2556	45

* *Comprehensively planned development*

** *Based on one lot per unit*

In the engineering design and quantity takeoffs, allowances for improved lot grading and for landscaping the local parkettes were included. The overall engineering design was done in sufficient detail to permit quantity takeoffs to be prepared for each of the four plans.

SERVICING COSTS DETERMINED FOR EACH DESIGN

To determine the servicing costs from the quantity takeoffs, it was necessary to select a set of unit prices for the construction work. Although unit costs vary considerably across the Province, it would clearly be impractical to attempt to prepare cost estimates for every locality. We therefore selected a single set of unit costs which, from our experience, was generally representative of costs around the larger urban centres These unit costs are outlined in detail in Appendix D.

Using these costs and the quantity takeoffs, estimates were made of the cost of servicing each of the four subdivision designs. The results, summarized in Exhibit 3.6, show that there is little difference between the total servicing costs in each comparison. However on a per unit basis, the differences are significant. Note too that these are construction cost savings and that land savings have not yet been taken into account.

SAVINGS ESTIMATED FROM SITE DEVELOPMENT COSTS

Since each of the subdivision designs contained different total populations and hence would require different park and school acreage to support that population, it is clear that the important comparison is between the total development costs for the entire 200

SUMMARY OF SERVICING CONSTRUCTION COSTS (50 ACRES RESIDENTIAL) Exhibit 3.6

	ONTARIO		METROPOLITAN	
	CONVENTIONAL	PROPOSED	CONVENTIONAL	PROPOSED
ROADWAYS AND SIDEWALKS	$532,500	$510,500	$532,500	$559,500
WATERMAINS	132,500	116,000	132,500	127,000
SANITARY SEWERS	152,500	124,000	152,500	129,000
STORM SEWERS	266,500	215,000	271,000	183,000
SERVICE CONNECTIONS	193,000	112,000	251,000	131,500
GRADING	5,000	31,500	8,500	36,000
AMENITY AREA SURFACING	--------	15,500	--------	24,000
MISCELLANEOUS	64,000	56,000	66,000	59,500
ENGINEERING	108,000	106,000	111,000	112,500
STREET LIGHTING	43,500	47,500	43,500	52,000
HYDRO (U/G)	190,000	262,500	226,500	319,000
LOT IMPROVEMENT COST	--------	195,000	--------	304,800
TOTALS	$1,687,500	$1,791,500	$1,795,000	$2,037,800
NO. OF UNITS (50 ACRES)	263	414	340	507
COST PER UNIT	$6416.	$4327.	$5279.	$4019

acre site, and not for the 50 acre residential subdivision. Thus it was first necessary to determine park, school and residential acreage for the site. This is summarized in Exhibit 3.7 from the detailed analysis presented in Appendix E.

To develop a measure of the differences in serviced land costs between the four designs, estimates were made of the total development costs per housing unit for the 200 acre site. The costs included:

- residential servicing costs, determined by factoring up the costs in Exhibit 3.6 to estimate the servicing costs for all the residential land
- other servicing including schools, collector roads and perimeter road improvement
- land costs, and recoveries from the sale of school land using assumed land values of $35,000/acre for the Ontario comparison and $100,000/acre for the Metropolitan comparison
- municipal levies on a per acre and per unit basis
- other development costs, overheads and profits, estimated at 25% of total costs
- additional landscaping, grading and screening costs for the individual lots in the proposed designs as well as landscaping for the local parks or communal amenity spaces.

Taking these total costs and dividing by the number of units on the site gives, in effect, the serviced land cost per unit. These calculations are included in Appendix F and the results summarized in Exhibit 3.8.

SUMMARY OF 200 ACRE SITE

Exhibit 3.7

	ONTARIO		METROPOLITAN	
	CONVENTIONAL	PROPOSED	CONVENTIONAL	PROPOSED
TOTAL HOUSING UNITS	964	1478	1244	1806
POPULATION	3470	5320	4480	6502
LAND USE (ACRES)				
-residential	180.0	176.5*	179.6	174.4**
-school	11.3	14.2	9.2	14.2
-park	8.7	9.3	11.2	11.4
-Total	200.0	200.0	200.0	200.0
NET (LOT) DENSITY (u.p.a.)†	6.46	12.42	9.31	17.04
GROSS DENSITY (u.p.a.)	5.36	8.37	6.93	10.36

* *Includes 6.86 acres of communal amenity space*

** *Includes 9.95 acres of communal amenity space*

† *Excludes communal amenity space*

SUMMARY OF COST SAVINGS (FULL 200 ACRE NEIGHBOURHOOD)

Exhibit 3.8

	ONTARIO		METROPOLITAN	
	CONVENTIONAL ($000)	PROPOSED ($000)	CONVENTIONAL ($000)	PROPOSED ($000)
RESIDENTIAL SERVICING	6,185	5,698	6,565	6,172
OTHER SERVICING	872	1,589	876	1,996
LAND VALUE (LESS SCHOOL)	6,666	6,570	19,485	19,215
MUNICIPAL LEVIES	1,368	1,882	1,648	2,211
OTHER COSTS @25%	3,872	4,059	7,317	7,647
TOTAL COST	$18,963,000	$19,798,000	$35,891,000	$37,241,000
NO. OF UNITS	964	1478	1244	1806
COST/UNIT	$19,671	$13,395	$28,851	$20,620
REDUCTION/UNIT	$6,276		$8,231	

The total savings through use of the proposed standards varies from $6300 for the Ontario to $8200 for Metropolitan comparison. As an indication of the influence of assumed land values, if $20,000/acre had been used in the Ontario comparison the savings would have been about $5000/unit and if $70,000/acre were used in the Metropolitan comparison the savings would be $6300. Thus, whatever the assumption the savings are considerable; in these cases about 30% of serviced lot costs.

PLANNING VS. ENGINEERING SAVINGS APPROXIMATED

The per unit cost differences in Exhibit 3.8 take into account savings due to <u>both</u> the proposed engineering <u>and</u> the planning standards. But how much of the saving is due to the engineering changes and how much is due to the reduced lot sizes and other changes in the planning standards? Or, to put it another way, how much of the savings would be realized if changes were made just to the engineering standards and the planning standards were left at conventional levels? Or vice versa?

Given the general approach used in this study, the two types of standards are difficult to separate. However, to provide some understanding of this important distinction, we have prepared estimates of the savings if only one or the other of the planning or engineering standards were changed. The costs were based on extrapolations from the earlier full comparisons, and, as such, are not as accurate but nevertheless give an indication of the relative savings.

The results of this work are outlined in Appendix F. In summary, savings for the Ontario comparison due only to changes in engineering standards would result in savings of about $1800 or 28% of the total given in Exhibit 3.8. For the Metropolitan comparison, engineering savings are $2300 or again about 28% of the total.

* * *

To conclude this chapter, we would emphasize that our purpose here has been to illustrate the order of magnitude of savings involved through use of reduced standards. The actual savings in any one part of the Province will vary depending on local servicing costs, land values and so on. It is clear, however, that regardless of the cost assumptions which might be adopted, the savings are considerable.

4. Conclusions and Implications

It can be hazardous to draw sweeping or generalized conclusions from a specific comparison. Here we have examined a specific site for two market conditions using defined engineering and site planning standards. Can one draw general conclusions from such an exercise? We believe we can, not only because of the magnitude of the savings demonstrated in the comparisons but also because of the conservative approach adopted in our work. Finally, it is important to consider the implications of the findings and, in particular, what problems stand in the way of reducing housing costs through changes in minimum standards.

<u>While there are savings in reduced engineering standards, the bulk of cost savings result from changes in planning standards</u>.

Our breakdown of the total potential savings showed that the reduced engineering standards accounted for about 28% of the savings. Thus planning standards account for the bulk of the savings, in fact close to three quarters of the total. While many changes were introduced in our proposed planning standards the important one is the use of reduced lot sizes. Thus zero lot line and comprehensively planned developments hold considerable potential for reducing housing costs.

This is not to say that there are not significant savings through reduced engineering standards. In particular, acceptance of a few of the proposed standards - specifically regarding service connections to individual units, storm

sewer design and roads and sidewalks - would realize the bulk of the estimated savings.

Using reduced standards, total cost savings per unit are considerable.

By any measure, the savings ranging from $6000 to $8000 per lot identified as in Chapter 3 are significant. For example a $6500 reduction, if wholly passed on to the homebuyer would reduce his monthly carrying charge by $70 on a 25 year, 12% mortgage. On a $50,000 mortgage this would amount to a 14% reduction in payments.

Expanding the savings to the Province as a whole is difficult. We do not know what proportion of housing would actually be built to the reduced standards employed in this study, even if they were permitted by the municipalities. However, regardless of the assumptions made, the savings would be large. For example, if it were assumed that a $6,500 savings could be realized for even a quarter of the approximately 60,000 new subdivision units built annually in Ontario, the yearly savings would amount to about $100 million. That is equivalent to an additional 1,500 housing units at $65,000 each. Therefore, regardless of the cost assumptions used, and however the results are expressed, the savings are considerable.

Yet, reduction of standards need not be extreme in order to gain such cost savings.

Throughout our work, when facing a decision as to what conventional and proposed standards to employ for comparison where one could readily justify several, we have chosen the ones which would tend to reduce rather than maximize the

cost savings. Hence the conventional standards adopted for comparison were far from the most conservative to be found in the Province and the proposed standards are not at all as reduced as one might be able to justify.

In fact, our basis for selecting most of the proposed standards was that they were already in use in one form or another somewhere in the Province. As such, then, the minimum standards used in the comparison were merely a compendium of the most progressive current practice in the Province, and in the case of site planning standards were those recommended by the largest mortgagors of subdivision housing (CMHC). As a result the designs prepared are not limited to a small selection of housing types but demonstrate solutions for a wide range of lot sizes and housing types applicable to all but luxury subdivisions. Nevertheless if still further cost savings were desired further specific reductions (as mentioned in Chapter 2) could be considered in future after additional study.

Nevertheless, all the savings may not get passed on to the buyer.

It is important to point out that the market value of a lot reflects demand pressures as well as the land, servicing and other costs associated with its development. Thus if standards are suddenly reduced, any savings will not automatically be reflected in a reduced selling price.

After all, the price will be what the seller can get for the lot. In an area where there is an over-supply and competition between developments there is more likely to be a reflection of the actual cost reductions in the selling

price. Even here, however, since most lots are sold with houses on them, housing design and costs play a role in market values of the total package. The tighter or more imperfect the housing market the less likely that the full savings will be reflected in lower market values and the greater the likelihood that the developer (or, for that matter, the municipality) will intercept some of the savings before they reach the consumer.

However, even acknowledging these realities, the essential point is that reduced, yet realistic standards will provide greater flexibility to match the house that is built to the buyer's ability to pay. There is unquestionably a market for lower priced units and if allowed to, many developers would build to lower standards in order to attract this market. Reduced development standards could have a similar effect to the condominium legislation of a few years ago; make home ownership available to a segment of the market previously unable to afford it.

<u>Finally, the municipalities' hesitancy to adopt reduced standards must be appreciated</u>.

While it might appear that many municipalities require unrealistically high development standards, in many instances the concern is not with the standards themselves but with their implications for municipal costs and revenues. The problem is that smaller houses on smaller lots appear to require much the same level of municipal services as more expensive housing, particularly in terms of education which accounts for a large share of the municipal budget. Some also claim that social, police and fire protection services are greater. On the other hand tax revenues are lower because of the lower assessments on smaller lots.

No definitive studies have been carried out on the relation between development standards, and municipal costs and revenues. While some municipal costs and revenues are clearly adversely affected by reduced standards, for others the reverse appears true. For example many municipal services are more closely related to the length of streets, rather than to the number of units. For example road and sewer maintenance, public transit and garbage collection all fall into this category and should be more economically provided (in terms of cost per dwelling served) under higher density conditions. However, to convince many municipalities of the advisability of reducing standards further, studies and the impact on municipal economics may be required.

*   *   *   *   *

To conclude, the adoption of reduced planning and engineering standards can produce significant benefits - cost savings for housing and even preservation of agricultural land surrounding Ontario's urban areas. Furthermore this can be achieved in conjunction with improving the architectural design and amenities of a community.

Finally, it should be emphasized that such a reduction in standards will not mean that <u>all</u> housing will be built to the new minimums - rather, it will provide greater flexibility in matching the housing package and its costs to the consumer's needs and budget.

Indeed, the results of this study have implications for what is coming to be called the consumer society. If Canadians will lower their expectations and accept a standard of living that - if not lower than before - is at least not rising at the same rates as the past three decades, then a reduction in development standards is in order.

Appendices

Appendix A.
Engineering Standards

This Appendix details the standards for storm drainage, sanitary sewers, water supply and road cross-section used in the cost comparisons. Details of the important standards were discussed in Chapter 2. Explanatory notes covering our justification for adopting the other standards, both for the conventional and the proposed designs, are included.

STORM DRAINAGE

STANDARD	CONVENTIONAL STANDARD	PROPOSED GUIDELINES		SEE NOTE NO
SYSTEM FUNCTION	To Service All Frontage, Footing & Roof Drainage Via Service Connection	To Service Road Catchbasins; Roof Drainage to Ground; Footing Drainage Pumped to Ground if Required by Water Table		1
DESIGN (Note 1)				
Storm Intensity-Sewer	5 Yr.	2 Yr. with Surface Overflow, & without Storm Connections		1
Storm Intensity-Surface Overflow	Not Required	25 Yr.		
Initial Entry Time	10 Min.	No Max.; Set by Overland Flow Time Based on Full Dev. to Drainage Limit		
CO-EFFICIENTS		Per Southern Ontario Space Stds.	Per Metro-politan Space Stds.	
Detached	0.40	0.60	0.55	
Semi-Detached	0.40	0.60	0.55	2
(Street) Town Housing	-	0.65	0.65	
(Block) Town Housing	0.60			
Apartments	0.75			
Schools	0.75	PER OHAC CO-EFFICIENT TABLE		
Industrial	0.75			
Commercial	0.75			
Parkland	0.20	0.25	0.25	

STORM DRAINAGE (CONT'D)

STANDARD	CONVENTIONAL STANDARD	PROPOSED GUIDELINES	SEE NOTE NO.
PIPE			
Diameter	12"	10"	3
Cover-Gravity Service Connection to Footing	7½'	7½'	
Cover - No. Conn. to Footing	5'	2½' Min. or Depth to Frost	4, 5
Curvilinear	NO	YES	
MANHOLES			
Spacing	300'	550'	6
Max. Inlet Diam. with Junction L > 45°	18"	21"	6
Min. Inlet Diam. with y Junction instead of MH	30"	24" with MH within 50'	6
CATCHBASINS			
Spacing (to 32' Pavement):			
- up to 3.0% grade	300	350	7
- 3.0 - 4.5%	300	300	
- 4.5 and over	225	250	
Additional Spacing with Double or Side Inlet	NONE	YES	7
Sump Req'd.	YES	NO	7
C.B. Manholes Permitted (Sewer Alignment @ Curb)	NO	YES	7
Lead Diameter	10" Single & Double	8" Single & 10" Double	
SERVICE CONNECTIONS	Single, in Common Trench with Sanitary	NONE	1

STORM DRAINAGE NOTES

1. System Function. Discussion of the basic conventional and proposed systems is also contained in the text.

   Storm drainage system costs are the largest and most variable element of residential development servicing cost now experienced.

   Storm drainage practice, as usually now applied, results in systems which eliminate surface ponding, and provide for the rapid runoff of surface flows and their removal into below grade conduits under relatively short term storm intensity conditions. In providing storm service connections, the systems also enclose roof drainage, and provide foundation drain outlets to provide a degree of protection against basement seepage damage. The systems, however, usually exclude provision for the consequences of long term intensity conditions, and by their emphasis on rapid runoff and removal, exclude consideration of local and downstream ecological and environmental considerations i.e. effluent water quality and water table relationships.

   The objectives involved in these exclusions appear to an extent, to be contradictory with the current practice. There is also the matter of the cost benefit relationships posed by the various degrees to which the conventional current practice approach can be applied.

   The proposed guideline system is intended to be a minimum cost reconciliation of what are considered

to be the essential objectives of urban storm drainage: - the elimination or minimizing of flood damage and hazard under long term storm conditions, and the removal of street surface flows under short term conditions to the extent required to provide a reasonable level and frequency of convenience and safety for pedestrian and traffic use.

The approach to lot drainage is unchanged, although the addition of roof discharge, the proposed general use of front lot drainage, and the elimination of footing drains, make it even more imperative that lot grading be properly designed and executed.

The elimination of storm connections has the effect of divorcing basement flooding consideration from relationships with street sewer capacity, and assists in justifying reduction in sewer design criteria. It also has the effect of eliminating outlets for foundation drains. The long term function of such drains is a matter of opinion, and to the extent that they do function, they are often only providing protection from the possibility of improper basement construciton or lot grading. In any event, the effect of the guideline system is to not eliminate footing drains but where needed, to redirect their discharge via sump pump installation to the ground surface.

It is also not intended to suggest, that under certain conditions, the installation of storm service connections, with the related increase in size and length of the street storm sewer installation, as under present practice may not still be appropriate.

In some instances, that would be an economic decision decided by the level of convenience and protection desired by a particular local population and their ability to accept the additional costs involved. In other instances it may be dictated by particular ground conditions.

In proposing the guideline system, however, due regard has been given to the OHAC proposals, and to the existence of significant areas of the Province, which have a similar normal level of service (i.e. no storm connections) with the evidence of acceptability indicated by their continuation of the practices.

2. Co-efficients. The discussion contained in the text (page 2.4) indicates the basis of the proposed runoff co-efficients. It is to be noted that the magnitude of difference from the conventional co-efficients results, in part, from the minimum lot sizes proposed, and in part, from taking the amount of building area coverage to be the maximum permitted by the proposed minimum yard distances. The result is ultra-conservative in that no allowance is made for the occurence of lot areas over the minimum due to particular plan design and efficiency factors, and no allowance is made for the averaging effect on building coverage which would actually result from the use of different building sizes and types. In practice, therefore, the proposed co-efficients deserve some adjustment to realistically reflect these factors.

It is also to be noted that the metropolitan co-efficients given for detached and semi-detached uses are less than those given for Southern Ontario. This difference arises because the metropolitan space standard permits slightly less building area in proportion to overall lot size, and the resultant decreased proportion of impervious area affects the co-efficient values which were otherwise calculated in the same way.

The basic increase in co-efficients is due to the lot standards proposed. Since storm sewer capacity is proportional to the co-efficient used, the effect is toward increasing storm sewer sizes and costs, beyond those required for conventional development. Thus in the cost estimates much of the cost effect of the proposed storm drainage criteria is consumed by the capacity cost increase required for the proposed lot standards.

3. Diameter. The diameter differential proposed from the conventional, is not particularly significant in cost terms, and would not be frequently utilized due to the initial flow requirements generated by the guideline standards. Where the standards would permit, however, size is considered to be somewhat more rational in terms of hydraulics and cost, and without any real maintenance significance.

4. Cover. Where storm service connections would be provided, no cover differential is proposed. Elsewhere, depth of cover is taken to be below frost level. Locating storm sewer structures within

frost susceptible strata is considered to be an unjustified increase in exposure to maintenance and repair costs, when related to the minimal cost savings which would result.

5. Alignment. Radius pipe is now in general use for larger diameters. Curvilinear pipe is proposed for smaller diameters due to the same considerations as discussed in the sanitary sewer notes following. Such use, in combination with the reduced cover made possible by the elimination of storm service connections, encourages the use of a curb related sewer alignment, as shown on the roadway sections, and thus the use of combined manhole-catchbasin structures. Size and depth limitations must be set for such curb related sewer alignments, and beyond these, it is to be expected that the sewer would be shifted into the roadway to preserve utility clearances and curb integrity.

   In that case, dual alignment with the sanitary sewer could become preferable to minimize the trenching effects on roadway construction. The standards make no reference to such dual sewer construction. This is a conventional technique which is usually found to be more expensive, notwithstanding trenching advantages, because of the restrictions imposed by straight pipe and frequent manhole spacings. The proposed guideline criteria therefore makes dual construction much more practical, and its use in appropriate circumstances is expected.

6. Manholes. Spacing considerations are as discussed in the sanitary sewer although due to the catch-basin function which would be frequently combined,

basin function which would be frequently combined, the spacings would often be much less than the maximum.

The two junction standards given are intended to provide definition on a subject not dealt with in the OHAC proposals, and which, under some current practice, results in a substantial additional number of structures.

It is assumed that all junction structures retained by the proposed standards would be adequately sized to provide efficient channeling.

7. Catchbasins. It is now conventional practice to provide catchbasins with sumps to settle out organic and other solid matter borne by gutter flows. The result is a cleanout maintenance program with stagnation in the intervals between, and consequent effect on effluent water quality. It is suggested that the sumps be eliminated and flows be allowed to pass through the system to primary sediment collection points which can be more readily serviced. Some deposits would settle out in the sewer system in the short term, but would be subject to the flushing effect of the more major storm flows.

The practical acceptability of the approach is indicated by the relatively frequent use of catch-basin - manholes without sumps in some areas, even where catchbasin sumps may still be required.

Catchbasin interval as expressed in terms of single grate units is unchanged from the OHAC spacing

recommendations. These appear, however, to be based on a flow depth to top of curb to accommodate flow volumes generated by a 50 year storm interval. The same spacing for the shorter term storm intervals used to establish sewer capacities substantially reduces the flow depth, thus minimizing the inconvenience factor and the inefficiencies resulting from any overshoot effect.

Side inlet or double units are proposed to be used at surface flow low points, and may be also used at the upgrade end of storm sewers, with an appropriate increase in permitted gutter drainage length (taken for these estimates to be an additional 70% of single spacing). Along storm sewer alignments single units are expected, although double units could be substituted with similar spacing increases.

SANITARY SEWERS

STANDARD	CONVENTIONAL STANDARD	PROPOSED GUIDELINES	SEE NOTE. NO.
PIPE			
Diameter	10"	8"	1
Cover	9'	8' (1' Clear of Storm)	2
Curvilinear	No	Yes	3
MANHOLE SPACING	300'	550'	4
SERVICE CONNECTION LOCATION	Single, common trench with storm	Double, common trench with water	5

SANITARY SEWER NOTES

1. Diameter. The differential between the minimum 8" diameter proposed (as OHAC) and the 10" diameter taken to be conventional, is not particularly significant in cost terms. There are, however, already many areas using the 8" size which provides better hydraulics in the typical low flow situation encountered in development areas, and with modern equipment, therefore, has better maintenance characteristics.

2. Cover. The difference between conventional and proposed cover requirements reflects the absence of a basement related storm sewer which normally forces the sanitary sewer deeper than the storm sewer to provide for pipe crossings, and that with conventional building grade relationships, the proposed depth is sufficient.

3. Alignment. The conventional requirement is taken to be for straight pipe alignment between manholes, although curved alignments have been employed in some municipalities for considerable periods of time, apparently with acceptable results.

   With the curved street patterns created by present planning practice, straight pipe alignments result in a high manhole frequency and horizontal interference with other utility and surface alignments. Curvilinear sewer alignments are proposed to eliminate these problems and the consequent cost effects. The proposal is based on the availability of modern sewer cleaning and inspection equipment to eliminate problems in these areas. The residual

increase in maintenance cost, if any, is expected to be minor, and together with the additional layout and installation procedures required for proper construction, to be acceptable in relation to the advantage which results.

The proposal, while beyond the OHAC recommendation, is also considered to be justified by the evidence of existing use.

4. Manhole Spacing. The conventional spacing limits are a long standing requirement for maintenance convenience. The guideline proposals follow the OHAC recommendations which recognize that with the modern sewer cleaning equipment now available, the restrictions appear to no longer be necessary. This is evidenced by much current maintenance practice which utilizes only some of the available manholes for access.

   The cost saving involved in extending spacings in conjunction with use of curvilinear pipe becomes particularly significant. An additional advantage is the reduction of structural interruptions in the roadway section.

5. Service Connections. There is wide variation in present practice in the provision of sanitary sewer connection, but from experience the most frequently met requirement is for separate connection to each unit with common trench installation with a storm connection allowed. We have taken this to be the conventional requirement.

This requirement appears to be directed to confining any maintenance disruptions to a single unit, and to convenience and simplicity in assessing cost responsibility. This can not be justified in construction cost terms, as demonstrated by the number of areas which do allow double services, and must therefore have acceptable experience with them.

WATERMAINS

STANDARD	CONVENTIONAL STANDARD	PROPOSED GUIDELINES	SEE NOTE. NO.
PIPE			
Diam. with Hydrants	6"	6" but 4" to last hydrant on dead ends	1
Cover	5½'	5' Min., or depth to frost	1
Diam. Beyond Last Hydrant	6"	2" down to 1" min. Straight-4"Ø D.I. or 2" Flexible -1" to 9 units -1½" to 10 " -2" to 20 "	1
Length Without Looping	-	40 units	2
VALVES			
Min. Pipe Diam. for Chamber	6"	10" gate	3
Line Interval	700±	40 unit interval	2
Intersection Valving	2@ T; 3@ X	2@ T; 3@ X	2
HYDRANTS			
Valve Requirement	All	Main> 6" & on neighbourhood collector & arterial streets	4
Spacing	400' (Line)	500' from far point of unit (i.e. 850'± line)	4
SERVICE CONNECTIONS			
Location	Single, separate trench	Double, in common trench with sewer service	5
Diam.	3/4"	3/4" single element 1" double element	5

WATERMAIN NOTES

1. Diameter and Cover. The OHAC survey results and recommendations have generally been retained. The main variation concerns cul-de-sac installations where the usual present practice is to carry the full main size to terminate at a hydrant at the end of the street, with the pipe following the curb around the bulb with a series of bends. It is proposed to relocate the hydrant away from the end of the street with pipe diameter reduced to the hydrant and beyond to reflect the actual supply requirement, and as a result, to allow the utilization of flexible pipe to eliminate bends. The cost savings which result can become significant due to the frequent use of the cul-de-sac street form in present planning practice. The proposal involves no apparent reduction in fire protection standard or in operation or maintenance results from the evidence of the several areas which use the system.

2. Valve Spacing and Looping Interval. The value of 40 units given is as recommended by OHAC. It is a judgement figure established to reflect a reasonable limit of service disruption during repair. Interval definition in terms of units is more rational than by main length as is usually the case. Existing practice therefore varies widely from the value given.

   The intersection valve requirement is unchanged from the given conventional practice, which, however, ignores the relatively frequent requirement in some areas for valving on all intersecting mains.

3. Valve Chambers and Boxes. In operational terms, use of valve chambers on small diameter mains may be regarded as a rather expensive luxury, as evidenced by the continued acceptance and use of valve boxes in many areas. The requirement for chambers is, however, so common that it has been taken to be conventional practice. The proposed guidelines, however, reduce the 12 inch OHAC main size for chamber use to 10 inch in consideration of the operation difficulties involved in relation to frequency of use.

4. Hydrants. Conventional practice in hydrant spacing appears to reflect the objective that C.U.A. coverage requirements be met with any particular hydrant out of service, thus in effect halving the spacing and doubling the number. The recommended spacing accepts the C.U.A. requirement without the contingency attitude which cannot be justified with current equipment, hydrant design and maintenance standards.

   Hydrant valves are proposed to be retained, as in present practice, on those mains which have an area distribution function, and for local service mains on neighbourhood collector and arterial streets where traffic volumes, at least in theory, potentially raise the incidence of damage. Contrary to frequent practice, which is taken to be conventional, valves are proposed to be eliminated from local mains on local streets, where frequency of damage and repair time are considered to be acceptably low in relation to the disruption factor.

5. <u>Service Connections</u>. Present location practice is quite variable but the single service separate trench arrangement appears to still dominate; apparently reduce disruption to an absolute mininum, and to maximize maintenance and public considerations. There is no practical reason for avoiding common trench installations with sewers as evidenced by the areas which so permit. The use of double services is an obvious cost effective proposal, which maintains disruption exposure at a level which must be considered to be acceptable in relation to frequency. The areas which do employ double services without apparent problem, including noise factors, are evidence of their acceptability. The service diameters as proposed are in accordance with present capacity criteria.

COLLECTOR ROADS

STANDARD	CONVENTIONAL STANDARD	PROPOSED GUIDELINES		SEE NOTE NO.
MINOR COLLECTOR				
Unit Limit (Note 1)	-	Up to Approx. 350 (Min. 2 Street Conn. or 175 per Conn.)		1
Traffic Volume (AADT)		Up to Approx. 1,500/ Conn. @ 8½/Unit		1
Road Allowance Width	66'	66'		2
Pavement Width	28'	28'		1
Pavement Depth	3"	3"		3
Granular Depth	12"	12" Min.		3
Boulevard Width	19' + 19'	19' + 19'		2
Sidewalk - Sides	2	2		2
- Width	5'	5'		2
Curb	Barrier C & G	Barrier C & G - 18" Width		4
Neighbourhood Collectors				
COLLECTORS				
		Medium	High Capacity	
Unit Limit	-	Up to Approx. 450/each Arterial Outlet Conn.	Approx. 450 & up/each Arterial Outlet Conn.	1
Traffic Volume (AADT)	-	Up to Approx. 3,400/ Conn. @ 7½/unit	3,400 & up/Conn. @ 7½/unit	1
Road Allowance Width	76'	70'	80'	2
Pavement Width	36'	32' (Plus Turning Lane @ Arterial Intersections)	42'	1
Pavement Depth	3"	3"	3"	3
Granular Depth	12"	15"	15"	3

STANDARD	CONVENTIONAL STANDARD	PROPOSED GUIDELINES	SEE NOTE NO
COLLECTORS (Cont'd.)			
Boulevard Width	20'	19' + 19'	2
Sidewalk - Sides	2	2	2
- Width	5'	5'	2
Curb	Barrier C & G	Barrier C & G - 18" Width	4

COLLECTOR ROAD NOTES

1. Classification and Pavement Width. General description of the proposed classification system is given in the text. As observed, the guideline proposals reset the limit between local and collector use at a point of 150 dependent units. The OHAC limit of 100 units is totally inconsistent with existing planning and engineering practice which usually applies local, rather than collector road, requirements up to and well beyond the 150 unit level with obviously acceptable results in terms of traffic facility for the 28 foot pavement width normally employed.

   The proposed local road standards reflect this situation, and the proposed collector road standards also reflect, by proposing a sub-neighbourhood or minor collector classification to retain the 28 foot pavement and provide collector width boulevards. The intended configuration is an internal finder street to collect traffic from several local classification streets, and discharge to the primary neighbourhood collectors, rather than connecting to external arterial roads. The given upper limit criteria, as expressed in terms of dependent units per street connection, has been set on a judgement basis and tested in relation to existing neighbourhood situations with acceptable traffic function.

   True neighbourhood collectors function to provide for both circulation through the neighbourhood and access or egress. Neighbourhood collector configu-

rations are established as a part of the development plan design and wide variations in form and function are possible. The roadway width requirements follow from the individual design and are influence by a variety of factors including pattern detail, the number of dependent units, location of community facilities, the number and orientation of outlets, their relationship with external origin-destination points, etc. Collector roads, by definition, have frontage use and are, therefore, subject to the same parking assumptions as internal streets.

The OHAC proposals contain two collector pavement sections but make no definition of use other than the 100 unit limit and parking restrictions for the narrower section. The guideline proposals herein utilize the two OHAC sections, but intend the narrower section (32 ft.) to be for the medium capacity traffic loadings generated by normal neighbourhood density and size conditions, and intend the wider section (42 ft.) to be for possible use in large dense neighbourhoods. The given limit between the two is expressed in terms of dependent units per arterial outlet connection, together with related AADT figures, which have been set on the same judgement basis as referred above for the minor collector.

Expressing collector roadway requirements in those terms, with the numerical values given, is intended to provide a simple criteria for general interim reference in the absence of properly researched and definitive criteria. The development of such criteria

is beyond the scope of this report but is imperative with the trend to large, dense and cohesive neighbourhood plan designs to avoid the possibility of either excessive or inadequate pavement widths. This, for example, would appear to be the result of application of the OHAC proposals in their expressed form.

The guideline proposals also assume collector pavement and road allowance widenings to provide arterial intersection improvement in the form of turning lanes and traffic islands for safe and efficient turning movements. Such construction is provided for in the estimates. This is an area sometimes neglected under current practice. It is also possible in some instances that similar improvement may be desirable at internal collector intersections.

2. Boulevard and Sidewalk. All of the collector classifications provide 19 foot boulevards and 5 foot sidewalks on each side as porposed by the OHAC study. These are also the conventional standards which have been assumed (on the basis of experience rather than the OHAC survey results which are considered to be inapplicable) and therefore utility and pedestrian facilities are considered to be unchanged.

While the guideline standards give no indication of other sidewalk construction details continuous 5 inch depth concrete walk, without expansion joints, extra driveway depth or granular base cushion was considered to be normal and used for the estimates.

Variation from this criteria would, however, be necessary in some locations to reflect local ground conditions.

3. Roadway Section. The median standards given by the OHAC has been taken to be conventional practice, and are generally retained in the guideline proposals, for estimate purposes. The pavement and base depths are intended only to illustrate an average condition. They are not to be considered to be in substitution for the application of the proper pavement design procedures which are required to take into account particular loading conditions material availabilities, and existing sub-grade conditions.

4. Curb. Barrier curb and gutter is taken to be the conventional requirement for collector roads from experience since no reference is made in the OHAC survey results. The curb and gutter section proposed by OHAC has been retained for the guideline standards with extrusion construction and continuous reinforcing assumed. It is considered that precast and two stage forms are unnecessarily expensive for general use.

MINOR LOCAL ROADS

STANDARD	CONVENTIONAL STANDARD	PROPOSED GUIDELINE	SEE NOTE NO.
CONFIGURATION	All	Crescent, P-loop Cul-de-sac	1
UNIT LIMIT (Note 1)	-	Up to 100 (Min. 1 Street Connection)	1
TRAFFIC VOLUME (AADT)	-	Up to 1,000 (@ 10/ Unit)	1
ROAD ALLOWANCE WIDTH	66'	50'	3
BOULEVARD WIDTH	19' + 19'	9' + 15'	3
PAVEMENT WIDTH	28	26' *(24')	2
LOCATION	-	2' Offset	3
ASPHALT DEPTH	3"	3"* (2")	4
GRANULAR DEPTH	12"	12"* (10") Min.	4
IDEWALK - Sides	2	1* (0)	5
- Width	5	4	
URB	Barrier C & G	Rolled Curb & Gutter 12" Width	6
UL-DE-SAC			
Right of Way RAD	60'	50'	7
Pavement RAD	41'	35' (No island)	7
Boulevard Width	19'	15'	7

Proposed Guidelines may be reduced to bracketed limits on Cul de sacs with 40 units max. and 350' max. length to bulb

LOCAL ROADS

STANDARD	CONVENTIONAL STANDARD	PROPOSED GUIDELINE	SEE NOTE NO.
CONFIGURATION	All	All	1
UNIT LIMIT	-	Up to 150 (Min. 1 street connection)	1
TRAFFIC VOLUME (AADT)	-	Up to 1500 (@ 10/Unit)	1
ROAD ALLOWANCE WIDTH	66'	56'	3
BOULEVARD WIDTH	19 + 19	12 + 16	3
PAVEMENT WIDTH	28	28' (26' crescents) P-loops inside emergency access	2
LOCATION		3' Offset	3
ASPHALT DEPTH	3"	3"	4
GRANULAR DEPTH	12"	12" Min.	4
SIDEWALK - SIDES	2	1	5
- WIDTH	5	4' (Conc.)	
WALKWAYS - Pedestrian	-	5' (Asphalt)	8
- Emergency Access*	-	12'(Asphalt)	8
CURB	Barrier C. & G.	Rolled curb & gutter 18" width	6
CUL-DE-SAC -			
RIGHT OF WAY	60'	50'	7
PAVEMENT RAD	41'	35' (No island)	7
BOULEVARD WIDTH	19'	15'	7

** Emergency access required for P-loops and cul-de-sacs*

MINOR LOCAL AND LOCAL ROADS NOTES

1. Classification. The OHAC survey of conventional road standards separates responses into high, median, and low categories with no indication of any relationship to function or configuration. The median standard has been taken on the basis of experience to be applicable to all local road configurations, although by their results, there must be obviously some local exceptions.

   As referred in collector road note 1, the OHAC limit of 100 units for local road definition is not accepted, and a new limit of 150 units proposed. Under current planning practice there are frequent examples of longer crescents, P loops, and connector streets with unit loadings in this range which obviously function as local streets, and not as collectors as proposed by the OHAC standards. The OHAC 100 unit limit is, however, retained to be the limit between the proposed new "local" and "minor local" classifications. The "minor local" classification is further restricted to cul-de-sac, crescent, and P loop street forms for which traffic use is self generating.

   The proposed classification definition and limits have been set from experience, and judgement and tested in relation to relevant existing development practice, and are intended to provide a realistic basis for separating servicing requirements. They are not represented to be definitive, but as for the collector criteria, are for interim reference until fully researched criteria becomes available.

The given traffic volumes are multiples of the given maximum unit loadings and the same AADT factor as used by OHAC (10 times the number of units).

2. Pavement Width. The conventional standard has been taken to be 28 foot width for all local roads. This width has been retained for the proposed "local" classification streets with the highest and most variable traffic volumes, i.e. connector streets and P loop lengths between emergency access and outlet location.

A lesser degree of need for vehicle operaion facility and convenience, must, however, be considered to be acceptable as a matter of scale, as traffic volumes and speeds reduce. The guidelines accordingly propose a 26 foot width as providing a reasonable measure of operational convenience benefit for all other "local" streets, and all "minor local" streets except short cul-de-sacs. A further extension of the same approach has been used to propose a 24 ft. width for such streets where the loading, on a judgement basis, has been set to not exceed 40 units.

More severe reductions in pavement width from present practice have been frequently advocated. The cost-benefit relationships involved become very questionable however, as the amount of operational constraint increases rapidly and out of all proportion to the amount of additional cost saving. The guideline proposals accordingly do not consider

the possibility of further width reduction, although it may be that this could be found to be justified for certain of the classification conditions, or variations, following sufficient research and analysis.

3. Boulevard and Road Allowance Width. The traditional 66 foot road allowance has been taken to be the conventional standard for all local road classifications. In conjunction with the conventional 28 foot pavement, 19 foot boulevards result. The OHAC survey results have been disregarded.

   The proposed boulevard widths have been established by review of utility clearance and sidewalk requirements. Particular weight has been given to the discussion by OHAC and their proposals on utility clearance requirements, but some modification has been made to reflect other clearance practices which appear to be acceptable in certain areas. The major modification, as referred to in the text, is in making distinction between the apparent utility requirement for primary alignments with vault installations on one side of the street, and their requirement for only a secondary alignment on the other. They have, therefore, in reality, two sets of space and clearance requirements in contrast to present practice and the OHAC proposals, which provide for contingent primary alignments on both sides. The guideline standards accordingly propose a wider outside boulevard width to accommodate the primary utility alignment

together with watermains, sidewalks and street lights; and a narrower inside boulevard for secondary alignment and curb related storm sewer construction. These widths require in turn, the use of eccentric or offset, pavement construction alignments. These have been used in several locations, but to date objection has been made to this approach due to the possibility of location error and the inequality in boulevard space provided to property owners on the two sides. The objections are considered to be unjustified in consideration of the land area savings which are obtained.

4. Roadway Section. The "median" standard indicated by the OHAC survey is used for the conventional standard and retained for the guideline proposals except in the case of the short cul-de-sacs, where it is suggested that some modification could be considered due to the reduced traffic volume.

   The cost effect is, however, not great unless there a large number of cul-de-sacs and, except in such cases, the practical construction problems involved may dictate use of a common section.

   The comments of collector note 3 apply regarding base and pavement depth.

5. Sidewalk. Both the OHAC sidewalk survey results and proposals are retained. The 4 foot width continues to be used only in locations with low pedestrian volumes, where there is less justification for public snow clearing. Where such

clearing, however, is the policy, the OHAC recommendation for extra width is retained.

The discussion of sidewalk construction details given in collection note 2 applies to local sidewalk as well.

6. Curb. The OHAC survey gives no indication of the relative frequency of conventional use of straight barrier curb and barrier curb and gutter. From experience the latter is taken to be more frequent, and, therefore, the conventional standard.

   The OHAC proposal for rolled curb and gutter section is retained to eliminate driveway curb cut costs, and their proposed section adopted for guideline use. Their minimum width section (12") is proposed for minor local road use, and their heavier maximum width section (18") is proposed for all local roads as a matter of scale and durability in relation to the heavier traffic use. Since pavement widths are given between gutter faces, the difference in section has little cost effect and either could be substituted for the other.

   Extrusion construction and continuous reinforcing is assumed.

7. Cul-de-sac Detail. Conventional cul-de-sac standards vary widely. Those shown as conventional are in a median range drawn from experience.

   The guideline standards accept the proposed OHAC

local road pavement radius of 35 feet, add the primary boulevard width to yield a street line radius of 50 feet. They, however, stipulate no island construction to make allowance for truck movement and snow clearing operations, with backing movement. This accepts less than absolute efficiency in such operations, for the space savings which result.

8. Walkways. No conventional standard has been given for walkways due to the wide variations in practice. For the conventional design estimates 5 foot pedestrian walkways, and 12 foot emergency access walkways with concrete construction were assumed. In the guideline designs, pedestrian and emergency walkways are related to open space areas, and asphalt pavement construction is considered to be more appropriate. The respective widths are unchanged.

Appendix B.
Site Planning Standards

This Appendix contains the complete set of all site planning standards used for four designs, together with a fifth set indicating the minimum standards which could be practical for developments without comprehensively planned development (C.P.D.) procedures being required. From our studies relating to the four designs prepared, the standards apply to the following approximate densities:

		net (lot) density units per acre	gross density units per acre
conventional	- Ontario	6	5
	- Metropolitan	9	7
non-C.P.D.		10	7
proposed	- Ontario	12	8
(C.P.D.)	- Metropolitan	17	10

The justification for most of the standards used has been discussed in the main text of the report. Our rationales for the remaining standards are discussed in footnotes at the end of the following table.

* *Net residential area is lot area excluding streets, school and all park areas.*

SITE PLANNING STANDARDS

STANDARD	CONVENTIONAL ONTARIO	CONVENTIONAL METRO	PROPOSED GUIDELINES NON C.P.D.	PROPOSED GUIDELINES ONTARIO (C.P.D.)	PROPOSED GUIDELINES METRO (C.P.D.)
1. HOUSING MIX:					
-single detached	80%	50%	70%	80%	50%
-semi detached	20%	20%	10%	20%	20%
-link house	-	10%	10%	-	10%
-street townhouse (attached housing)	-	20%	10%	-	20%
2. PUBLIC OPEN SPACE					
-n'hd. & community park (ac/1000)	2.5	same	2.5	1.75	same
-local housing park or communal amenity space (C.A.S.)*	-	-	-	.75	same
	-		Total	2.5	
3. SCHOOL SITE AREAS:					
-public high schools	18 acres	15 acres	15 acres	same	same
-public junior high schools	10 acres	8 acres	8 acres	same	same
-public elementary schools	6 acres	5 acres	5 acres	same	same
-separate high schools	7 acres	6 acres	6 acres	same	same
-separate elementary	4 acres	3 acres	3 acres	same	same
4. MINIMUM LOT AREA - WIDTH AND DEPTH					
-single detached	5500 50x110'	4950 45x110'	4000 40x100'	3000 30x100'	2400 30x80'
-semi detached (1 unit)	3575 32.5x110'	3300 30x110'	3000 30x100'	2650 26.5x100' (20.5'unit)	2400 30x80' (24'unit)
-link house (average incl. wider end lot)	3520 32x110'	3520 32x110'	3200 32x100'	2600 26x100' (25'unit)	2360 29.5x80' (28.5'unit
-street townhouse (average incl. wide end lot)	2420 22x110'	2420 22x110'	2200 22x100'	2100 21x100' (20'unit)	1520 19x80' (18'unit)

** CAS term adopted from CMHC use*

STANDARD	CONVENTIONAL ONTARIO	CONVENTIONAL METRO	PROPOSED GUIDELINES NON C.P.D.	PROPOSED GUIDELINES ONTARIO (C.P.D.)	PROPOSED GUIDELINES METRO (C.P.D.)
5. MINIMUM YARD DISTANCE					
Front Yard					
-to habitable	25'	20'	15'	10'	10'
-to living room	25'	20'	20'	15'	15'
-to garage or carports with sidewalks	25'	20'	20'	20'	20'
-to garage or carport without sidewalk	25'	20'	20'	14'	14'
Rear Yard					
-to living room principal window	25'	same	35'	25' with privacy screening (35' w/o)	
-to habitable room other than living room principal window	25'	same	35'	18' with privacy screening (35' w/o)	
-lot backing onto arterial	65'	same	65' with privacy screening	65' with privacy screening	65' with privacy screening
Side Yards					
-internal side yards both sides	4'+2' for each storey or partial storey above the first storey (1)		4'+2' for each storey or partial storey above the first storey		
-zero side yard with maintenance assessment	not permitted	not permitted	not permitted	permitted	permitted
-flankage yard on corner lot	15'	15'	15'	4'+2' etc with privacy screening to exposed rear yard to street	4' with privacy screening to exposed rear yard to street

---

(1) See Explanatory Notes at conclusion of Appendix B

SITE PLANNING STANDARDS (CONT'D)

	CONVENTIONAL		PROPOSED GUIDELINES		
STANDARD	ONTARIO	METRO	NON C.P.D.	ONTARIO (C.P.D.)	METRO (C.P.D.)
6. MINIMUM FLOOR AREA & ESTIMATED COVERAGE FOR DWELLING UNITS (excl. garage & basement) sq. ft.					
	Bldg. Area Cov.		Assumed Bldg. Area Cov.		
-single detached					
1 storey	1000-1000	same	1000- 1000	same	same
1½ storeys	1200-var.	same	1000- var.	same	same
2 storeys	1400-700	same	1000- 500	same	same
-semi detached					
1 storey	1000-1000	same	1000-1000	same	same
1½ storeys	1000-var.	same	1000-var.	same	same
2 storeys	1300-650	same	1000-500	same	same
-link house					
2 storeys	1300-650	same	1000-500	same	same
-street townhouse					
2 storeys	1400-700	same	1000-500	same	same
7. MAXIMUM LOT COVERAGE					
-single detached	35%	same		N.A.	N.A.
-semi detached	35%	same		N.A.	N.A.
-link house	35%	same		N.A.	N.A.
-street townhouse	40%	same			
8. MINIMUM LANDSCAPED OUTDOOR LIVING AREA (OLA) ADJACENT TO DWELLING (Sq. Ft.)					
	N.A.	N.A.	½ gross finished floor area	same	same
9. MAXIMUM LENGTH LOCAL STREETS (2)					
-cul-de-sac	750' excluding bulb with 10' wide emergency access				
-p-loop	2800' excluding entry leg with 10' wide emerg. access				
-crescent	none stated		none stated		

STANDARD	CONVENTIONAL ONTARIO	CONVENTIONAL METRO	PROPOSED GUIDELINES NON C.P.D.	PROPOSED GUIDELINES ONTARIO (C.P.D.)	PROPOSED GUIDELINES METRO (C.P.D.)
10. CUL-DE-SAC AND OUTSIDE CORNER OF LOCAL STREET (3)					
-minimum turning circle at property line	60'R	same	50'R	same	same
-minimum turning circle at curb	45'R	same	35'R	same	same
11. PARKING SPACES					
-spaces per unit (off-street pavement)	2	same	2	same	same
-additional visitor parking spaces per unit on collector streets with parking one side only	0.5	same	0.5	same	same
-additional visitor parking spaces per unit on local streets with parking both sides on pavement of 26' or more	1	same	1	same	same
12. OFF-STREET PEDESTRIAN AND/OR EMERGENCY VEHICULAR ACCESS					
-vehicular right of way width	12'	same	12'	same	same
-vehicular pavement width	10'	same	10'	same	same
-pedestrian right of way width	10'	same	10'	same	same
-pedestrian pavement width	5'	same	5'	same	same
13. LOCAL STREET INTERSECTION SPACING (4)					
-general condition	200'	same	200'	same	same
-adjacent to intersections with arterials	150'	same	125'	same	same

EXPLANATORY NOTES

1. In addition to maintain minimum corner vision, house should be no closer than 20' from lot corner point.

2. Maximum local street lengths conform to CMHC Site Planning Handbook requirements.

3. Conventional standards for turning standards are representative of current practice while the proposed guidelines are in accordance with the recommendations of the OHAC report.

4. The intersection spacing results from the particular lot depths used.

Appendix C.
Lot Design Studies

As stated in Chapter 2, regarding the minimum lot sizes for the proposed Metropolitan standards, we employed 80 ft. deep lots where no sidewalk occurred and 86 ft. lots with sidewalks. In both cases lot widths varied from 30 to 40 ft. for singles down to 18 to 23 ft. for street town housing. Also we tested a range of architectural house designs, with attached garages on these various lot sizes to demonstrate the practicality of the lot design approach. These units generally range between 1,000 and 1,200 sq. ft. in area (excluding garage) but, as mentioned in the text, larger units (in the order of 1,400 to 1,500 sq. ft.) could be included in the designs prepared.

Exhibit C.1 summarizes the basic house types tested in the lot designs and Exhibits C.2 and C.3 present the studies showing the location of the various house types on 80 ft. and 86 ft. deep lots.

BASIC HOUSE TYPES TESTED BY DESIGNS AND BY LOTS

Exhibit C.1

All houses 1000-1200 sq. ft. living area excluding garage	80 ft. Lot 14 ft. set back to garage from front lot line no sidewalk	86 ft. Lot 20 ft. set back to garage from front lot line with sidewalk
	LOT WIDTHS	LOT WIDTHS
BUNGALOW	40 ft. S.F.	Same
SPLIT LEVEL BACK	40 ft. S.F. 35 ft. S.D.	Same
FRONT	40 ft. S.F. 35 ft. S.D.	Same
SIDE	40 ft. S.F. -	Same
LINK 2 STOREY WITH SINGLE STOREY GARAGE	28.5 ft. link	Same
2 STOREY	30 ft. S.F. 30 ft. S.D. 26.5 ft. S.D. 23 ft. S.T.H. 20 ft. S.T.H.	Same
3 STOREY	18 ft. S.T.H.	Same

k kitchen
l living room
d dining room
b bedroom
mb master bedroom
r recreation room
g garage
ь wash room

representative house·lot layouts

exhibit C.2

k kitchen
l living room
d dining room
b bedroom
mb master bedroom
r recreation room
g garage
b wash room

representative house·lot layouts

exhibit C. 3

Appendix D.
Unit Costs

This Appendix summarizes the unit costs used for the cost comparisons. Generally, we have adopted costs which are neither the highest in the Province, nor the lowest but what we would consider to represent typical conditions applying to the designs proposed.

UNIT COSTS

ITEM	UNIT PRICE	UNIT
SANITARY SEWERS (Gran. Bedding)		
8"Ø V/T or Conc-8-10'Depth	$ 11.00	L.F.
10-12'Depth	12.00	L.F.
12-15'Depth	13.50	L.F.
10"ØV/T or Conc -8-10'Depth	$ 12.00	L.F.
10-12'Depth	12.75	L.F.
12-15'Depth	14.25	L.F.
Precast Manholes -		
Bases and Covers	$450.00	EACH
Wall Structure	50.00	V.F.
Elevating	75.00	EACH
STORM SEWERS (Gran. Bedding)		
12" Conc - 6-8'Depth	$ 11.75	L.F.
8-10'Depth	12.75	L.F.
15" Conc - 6-8'Depth	13.50	L.F.
8-10'Depth	14.50	L.F.
18" Conc - 6-9'Depth	15.25	L.F.
9-12'Depth	16.50	L.F.
21" Conc - 6-9'Depth	17.50	L.F.
9-12'Depth	18.75	L.F.
24" Conc - 6-9'Depth	19.75	L.F.
9-12'Depth	21.25	L.F.
27" Conc - 6-9'Depth	22.50	L.F.
9-12'Depth	24.00	L.F.
30" Conc - 6-9'Depth	25.25	L.F.
9-12'Depth	27.00	L.F.
33" Conc - 6-9'Depth	28.75	L.F.
9-12'Depth	30.50	L.F.

ITEM	UNIT PRICE	UNIT
<u>STORM SEWERS</u> (Cont'd)		
36" Conc - 9-12'Depth	$ 34.50	L.F.
39" Conc - 9-12'Depth	39.00	L.F.
Precast Manholes - (Under Sanitary Sewers)		
Cast-in-Place Manholes - (4'x5')		
Cover	$150.00	EACH
Brickwork	100.00	V.F.
Wall Structure	150.00	V.F.
Base and Roof	600.00	EACH
Elevating	75.00	EACH
Catchbasins -		
Standard Single	$600.00	EACH
Standard Double	950.00	EACH
Shallow Single	475.00	EACH
Shallow Double	825.00	EACH
Catchbasin Leads -		
8"Ø Concrete	$ 10.00	L.F.
10"Ø Concrete	11.00	L.F.
<u>ROADWAYS</u>		
Rough Grading	$ 1.15	C.Y.
Fine Grading -		
Boulevard	0.40	S.Y.
Road	0.75	S.Y.
Granular Base -		
6" Depth	1.60	S.Y.
9" Depth	2.40	S.Y.
Stone Base - 4" Depth	1.35	S.Y.
6" Depth	1.90	S.Y.
Base Pavement -1¼" Depth	1.30	S.Y.
2" Depth	1.90	S.Y.

ITEM		UNIT PRICE	UNIT
ROADWAYS (Cont'd)			
Prime Treatment		$ 0.25	S.Y.
Surface Pavement -	3/4" Depth	1.05	S.Y.
	1" Depth	1.30	S.Y.
Curb and Gutter (Extruded and reinforced)	Rolled - 12"	3.10	L.F.
	Rolled - 18"	3.50	L.F.
	Barrier	4.25	L.F.
Boulevard Sod		1.15	S.Y.
SIDEWALKS			
Concrete -	4'Width	$ 4.85	L.F.
	5'Width	5.75	L.F.
	10'Width	12.25	L.F.
Asphalt -	5'Width (2" over 6" base)	4.75	L.F.
	12'Width (3" over 10" base)	9.50	L.F.
Concrete -	12'Width (6" base)	15.00	L.F.
WATERMAINS			
Pipe -	12"Ø D.I.	$ 19.00	L.F.
	8"Ø D.I.	11.00	L.F.
	6"Ø D.I.	8.50	L.F.
	4"Ø D.I.	7.00	L.F.
	1½"Ø Copper	5.50	L.F.
Valves -	12" & Chamber	$ 2,100.00	EACH
	8" & Chamber	1,400.00	EACH
	6" & Chamber	1,250.00	EACH
	8" & Box	600.00	EACH
	6" & Box	450.00	EACH
	4" & Box	350.00	EACH

ITEM		UNIT PRICE	UNIT
WATERMAINS (Cont'd)			
Hydrants -	Off 12" main with valve	$1,275.00	EACH
	Off 8" main with valve	1,175.00	EACH
	Off 6" main with valve	1,100.00	EACH
	Off 6" main no valve	650.00	EACH
	Off 4" main no valve	625.00	EACH
SERVICE CONNECTIONS			
Single Sanitary or Storm (Separate Trench)		$ 6.50 & 100.00	L.F. EACH
Single Sanitary and Storm (Double Trench)		9.50 & 210.00	L.F. EACH
Single Water Service (Separate Trench)		2.75 & 75.00	L.F. EACH
Sanitary and Water (Double Trench)			
- Sanitary Pipe only		6.50	L.F.
- Water Pipe only		2.75	L.F.
- Sanitary & Water Pipe only		8.50	L.F.
		&	
- Single Service		175.00	EACH
		or	
- Double Service		275.00	EACH
STREET LIGHTING			
- For Streets 28' Width & Below		$ 5.00	L.F./RD
- For Streets over 28' Width		6.80	L.F./RD
HYDRO (U.G.)		475.00	UNIT
		Plus	
		8.00	L.F./RD

Appendix E.
Land Use Analysis

This Appendix presents the calculations for converting the results of the sample designs on the 50 acre section to the full 200 acre neighbourhood subdivision.

LAND USE ANALYSIS

	ONTARIO		METROPOLITAN	
	CONVENTIONAL	PROPOSED (C.P.D.)	CONVENTIONAL	PROPOSED (C.P.D.)
GROSS AREA* SUBDIVISION PLAN	49.1 ac	49.44 ac	49.1 ac	48.97 ac
TOTAL UNITS SUBDIVISION PLAN	263	414	340	507
GROSS DENSITY	5.356 upa	8.374 upa	6.925 upa	10.355 upa
NET UNIT DENSITY	(6.5 upa)	(12.4 upa)	(9.3 upa)	(17.0 upa)
UNITS IN 180ac (GROSS RES. AREA)	964	1478	1244	1806
K-6 PUPIL FACTOR (EST.) -public elem.	.6	.6	.6	.6
K-6 PUPILS -public elem.	578	886	746	1083
NO. OF SCHOOLS -public elem.	1	2	1	2
PUBLIC J.H.S. 7-8 FACTOR (EST.)	.15	.15	.15	.15
7-8 PUPILS	144	221	186	270
NO. OF SCHOOLS 7-8	1 per 3 nhds.	1 per 3 nhds.	1 per 3 nhds.	1 per 3 nhds.
SEP. ELEM. SCHOOL PUPIL FACTOR (EST.)	.17	.17	.17	.17
SEP. ELEM. PUPILS	163	251	211	307
NO. OF SEP. SCHOOLS	1 per 2 nhds.	1 per 2 nhds.	1 per 2 nhds.	1 per 2 nhds.
POPULATION FACTOR/UNIT	3.6	3.6	3.6	3.6
POPULATION	3470	5320	4480	6502
NHD. & COMMUNITY	2.5ac/1000	1.75 ac/1000	2.5ac/1000	1.75ac/1000
STANDARD COMMUNAL AMENITY (MIN.)		.75ac/1000		.75ac/1000
-Actual Standard Provided		1.29ac/1000†		1.53ac/1000†
NHD. & COMMUNITY PARK	8.68ac	9.30ac	11.2ac	11.40ac
COMMUNAL AMENITY SPACE†	-	6.86ac	-	9.95ac
TOTAL PARK PROVIDED	8.68ac	16.16ac	11.2ac	21.35ac
ACTUAL PARK STANDARD PROVIDED	2.5ac/1000	3.04ac/1000	2.5ac/1000	3.28ac/1000

	ONTARIO		METROPOLITAN	
	CONVENTIONAL	PROPOSED (C.P.D.)	CONVENTIONAL	PROPOSED (C.P.D.)
NET RESIDENTIAL AREA	180.0ac	169.64ac	179.6ac	164.45ac
TOTAL N'HD. AREA				
-Res. area	180.0	176.5†	179.6	174.4†
-P.S.	6.0	10.0	5.0	10.0
-S.S.	2.0	1.5	1.5	1.5
-J.P.H.S.	3.3	2.7	2.7	2.7
-N & C Park	8.7	9.3	11.2	11.4
-Total Acres	200.0	200.0	200.0	200.0
NHD. POP DENSITY	17.4ppa	26.6ppa	22.4ppa	32.6ppa

* *Gross area = total area less adjustment for lots backing onto arterial*

† *C.A.S. standard included in residential area*

Appendix F.
Cost Comparisons

Exhibits F.1 and F.2 show our analyses of the total development costs for the two comparisons, and the consequent savings. Exhibit F.3 shows the total servicing construction cost for the 50 acre sub-division, assuming that conventional planning standards were adhered to throughout and only the engineering standards were reduced. Finally Exhibits F.4 and F.5 take these results, apply them to the larger site and compute total development costs, and hence cost savings resulting from changes in the engineering standards only.

DEVELOPMENT COSTS AND SAVINGS - ONTARIO STANDARDS (200 ACRES)

Exhibit F1.

ITEM	ONTARIO CONVENTIONAL CALCULATION	ONTARIO CONVENTIONAL AMOUNT	ONTARIO PROPOSED CALCULATION	ONTARIO PROPOSED AMOUNT
Servicing Cost	$1,687,500 x 180/49.1	$ 6,185,000	$1,596,500 x 176.5/49.44	$ 5,698,000
Lot Improvement Cost*		-----	1478 Units @ $470	695,000
Collector Road Cost for Comm. Area @ 50' per acre	@ $177/ft. for 1,000 ft.	177,000	@ $169/ft. for 1,175 ft.	199,000
Undeveloped Land Assumed Value @ $35,000 per acre	180.0 + 20.0 (Commun. Area) + 1.75 (Coll. Rd. Area) = 201.75	7,061,000	176.5 + 23.5 (Commun. Area) + 1.90 (Coll. Rd. Area) = 201.9	7,067,000
Perimeter Road Improvement (Assumed)	8,500 L.F. @ $70.00/ft.	595,000	8,500 L.F. @ $70.00/ft.	595,000
External Servicing Costs (Assumed)		100,000		100,000
Municipal Levies	201.75 AC @ 2,000	404,000	201.9 AC @ 2,000	404,000
	964 Units @ 1,000	964,000	1478 Units @ 1,000	1,478,000
SUB TOTAL		15,486,000		16,236,000
Allowance for Other Development Costs & Returns Incl. Profit	@ 25%	3,872,000		4,059,000
Less: School Recovery	11.3 AC @ 35,000	-395,000	14.2 AC @ 35,000	-497,000
Gross Recovery		$18,963,000		$19,798,000
Average Value Per Unit	(964 Units)	$ 19,671	(1478 Units)	$ 13,395

$6,276 differential

NOTE: *Lot improvement cost provides for additional costs required for landscaping of local park (CAS) areas, additional landscaping per unit, additional architectural design, architectural control and for privacy fencing.*

DEVELOPMENT COSTS AND SAVINGS - METROPOLITAN STANDARDS (200 ACRES)

Exhibit F2.

ITEM	METROPOLITAN CONVENTIONAL CALCULATION	METROPOLITAN CONVENTIONAL AMOUNT	METROPOLITAN PROPOSED CALCULATION	METROPOLITAN PROPOSED AMOUNT
Servicing Cost	$1,795,000 x 179.6/49.1	$ 6,565,000	$1,733,000 x 174.4/48.97	$ 6,172,000
Lot Improvement Cost		----	1806 Units @ $600	1,084,000
Collector Road Cost for Comm. Area @ 50' per acre	@ $177/ft. for 1,020 ft.	181,000	@ $169/ft. for 1,280 ft.	217,000
Undeveloped Land Assumed Value @ $100,000 per acre	179.6 + 20.4 (Commun. Area) + 1.79 (Coll. Rd. Area) = 201.79	20,179,000	174.4 + 25.6 (Commun. Area) + 2.09 (Coll. Rd. Area) = 202.09	20,209,000
Perimeter Road Improvement (Assumed)	8,500 L.F. @ $70.00 /ft.	595,000	8,500 L.F. @ $70.00 /ft.	595,000
External Servicing Costs (Assumed)		100,000		100,000
Municipal Levies	201.79 AC @ 2,000	404,000	202.09 AC @ 2,000	405,000
	1244 Units @ 1,000	1,244,000	1806 Units @ 1,000	1,806,000
SUB TOTAL		29,268,000		30,588,000
Allowance for Other Development Costs & Returns Incl. Profit	@ 25% of Sub Total	7,317,000	@ 25% of Sub Total	7,647,000
Less: School Recovery	9.2 AC @ 70,000	-644,000	14.2 AC @ 70,000	-994,000
Gross Recovery		$35,941,000		$37,241,000
Average Value Per Unit	(1244 Units)	$ 28,892	(1806 Units)	$ 20,620

$8,272 differential

COSTS WITH ENGINEERING STANDARDS CHANGES ONLY (FIFTY ACRES RESIDENTIAL)

Exhibit F3.

	ONTARIO CONVENTIONAL			METROPOLITAN CONVENTIONAL		
	Conventional Engineering Standards	Proposed Engineering Standards	Saving (Increase)	Conventional Engineering Standards	Proposed Engineering Standards	Saving (Increase)
Roadways & sidewalks	$532,500	$478,500	$54,000	$532,500	$478,500	$54,000
Watermains	132,500	109,000	23,500	132,500	109,000	23,500
Sanitary Sewers	152,500	116,000	36,500	152,500	116,000	36,500
Storm Sewers	266,500	201,500	65,000	271,000	201,500	69,500
Service Connections	193,000	73,000	120,000	251,000	90,500	160,500
Grading	5,000	29,500	(24,500)	8,500	31,000	(22,500)
Amenity area surfacing	-	-	-	-	-	-
Miscellaneous	64,000	50,500	13,500	66,000	51,500	14,500
Engineering	108,000	95,000	13,000	111,000	97,000	14,000
Street Lighting	43,500	44,500	(1,000)	43,500	44,500	(1,000)
Hydro (U/G)	190,000	194,500	(4,500)	226,500	232,500	(6,000)
Lot Improvement Cost	-	-	-	-	-	-
TOTAL	$1,687,500	$1,392,000	$295,500	$1,795,000	$1,452,000	$343,000

ENGINEERING COSTS AND SAVINGS - ONTARIO STANDARDS (200 ACRES)

Exhibit F4.

ITEM	ONTARIO CONVENTIONAL CALCULATION	ONTARIO CONVENTIONAL AMOUNT	ONTARIO CONVENTIONAL (with Proposed Servicing Standards) CALCULATION	ONTARIO CONVENTIONAL (with Proposed Servicing Standards) AMOUNT
Servicing Cost	$1,687,500 x 180/49.1	$ 6,185,000	$1,392,500 x 179.8/49.1	$ 5,099,000
Lot Improvement Cost		-----		------
Collector Road Cost for Comm. Area @ 50' per acre	@ $177/ft. for 1,000 ft.	177,000	@ $169/ft. for 1,010 ft.	171,000
Undeveloped Land Assumed Value @ $35,000 per acre	180.0 + 20.0 (Commun. Area) + 1.75 (Coll. Rd. Area) = 201.75	7,061,000	179,8 + 20.2 (Commun. Area) + 1.8 (Coll. Rd. Area) = 201.8	7,063,000
Perimeter Road Improvement (Assumed)	8,500 L.F. @ $70.00/ft.	595,000	8,500 L.F. @ $70.00/ft.	595,000
External Servicing Costs (Assumed)		100,000		100,000
Municipal Levies	201.75 AC @ 2,000	404,000	201.8 AC @ 2,000	404,000
	964 Units @ 1,000	964,000	985 Units @ 1,000	985,000
SUB TOTAL		15,486,000		14,417,000
Allowance for Other Development Costs & Returns Incl. Profit	@ 25%	3,872,000	@ 25%	3,604,000
Less: School Recovery	11.3 AC @ 35,000	-395,000	11.3 AC @ 35,000	-395,000
Gross Recovery		18,963,000		17,626,000
Average Value Per Unit	(964 Units) *	$ 19,671	(985 Units) *	$ 17,894

$1,777 differential

* *Difference in number of units is due to additional land recovered from reduction in road widths*

ENGINEERING COSTS AND SAVINGS - METROPOLITAN STANDARDS (200 ACRES)

Exhibit F5.

ITEM	METROPOLITAN CONVENTIONAL		METROPOLITAN CONVENTIONAL (With Proposed Servicing Standards)	
	CALCULATION	AMOUNT	CALCULATION	AMOUNT
Servicing Cost	$1,795,000 x 179.6/49.1	$ 6,565,000	$1,452,000 x 179.1/49.1	$ 5,296,000
Lot Improvement Cost		-----		-----
Collector Road Cost for Comm. Area @ 50' per acre	@ $177/ft. for 1,020 ft.	181,000	@ $169/ft. for 1,045 ft.	177,000
Undeveloped Land Assumed Value @ $100,000 per acre	179.6 + 20.4 (Commun. Area) +1.79 (Coll. Rd. Area) = 201.79	20,179,000	179.1 + 20.9 + 1.79 = 201.79	20,179,000
Perimeter Road Improvement (Assumed)	8,500 L.F. @ $70.00/ft.	595,000	8,500 L.F. @ $70.00/ft.	595,000
External Servicing Costs (Assumed)		100,000		100,000
Municipal Levies	201.79 AC @ 2,000	404,000	201.79 AC @ 2,000	404,000
	1244 Units @ 1,000	1,244,000	1293 Units @ 1,000	1,293,000
SUB TOTAL		29,268,000		28,044,000
Allowance for Other Development Costs & Returns Incl. Profit	@ 25% of Sub Total	7,317,000	@ 25% of Sub Total	7,011,000
Less: School Recovery	9.2 AC @ 70,000	-644,000	9.2 AC @ 70,000	-644,000
Gross Recovery		$35,941,000		$34,411,000
Average Value Per Unit	(1244 Units)*	$ 28,892	(1293 Units) *	$ 26,613

$2,279 differential

* *Difference in number of units is due to additional land recovered from reduction in road widths*